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A COMPREHENSIVE STUDY OF THE TOCKS ISLAND LAKE PROJECT AND ALTE--ETC(U)

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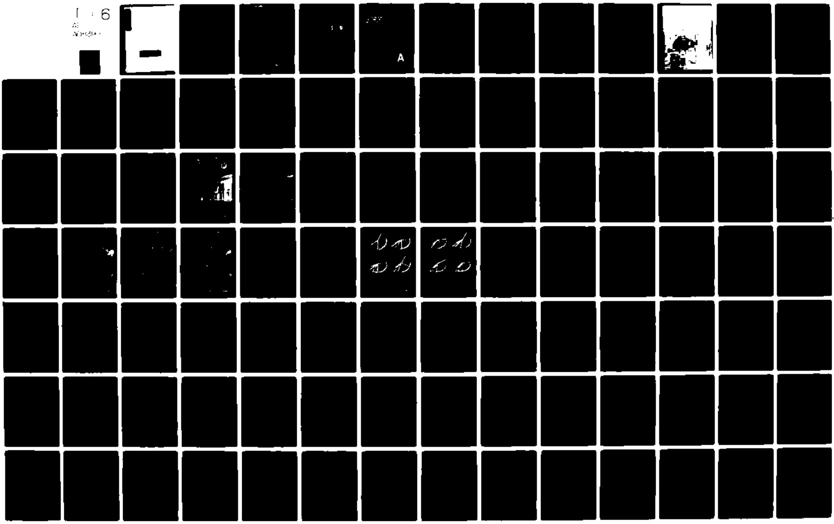

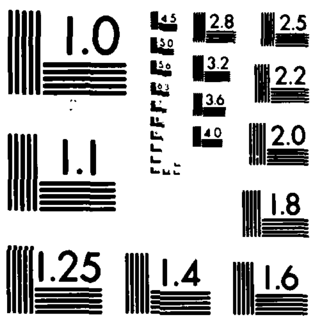

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The purpose of this study is to help decision makers determine future water resource needs of the Delaware River Basin area and ways of meeting these needs. This report undertaken in 1975 for the U.S. Army Corps of Engineers by a consultant firm describes and analyzes the outdoor recreational needs of the Delaware River Basin. Recreation demand forecast tables are provided in the data.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

A chapter on electric power development for the area and project power plant water consumption under both present and future technology. [redacted] water quality requirements upon 3 zones of the Delaware River is also studied.

A COMPREHENSIVE STUDY OF THE TOCKS ISLAND LAKE PROJECT AND ALTERNATIVES

JUNE 1975

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CHAPTERS IV,V & VI

A

ANALYSIS OF SERVICE AREAS AND RESOURCE NEEDS

INTRODUCTION

This is the second book of Part A and includes Chapters IV through VI. The initial chapters, I through III, are included in the first book. Also presented in the Introduction of that book are brief descriptions of the five parts of the study; a summary of the project's background and development; a Table of Contents for the complete study; and listings of Study Management Team members and Consultants involved in the study effort.

CONTENTS - PART A
CHAPTERS IV - VI

FIGURES

Outdoor recreation, as one of the authorized purposes of the Tocks Island Lake Project, must be analyzed within the context of the needs of a defined service area -- although its service area varies from that of flood control, water supply or power generation. Recreation is an intangible commodity and its analysis is substantially different from that produced by the other authorized purposes in several respects which influence the content and nature of this chapter compared with others in Part A.

First, the output is not a fixed, measurable quantity such as kilowatts of electricity or gallons of water of a certain quality; the recreation commodity is, in economic terms, highly substitutable -- a person may enjoy swimming and derive a value from the experience but he may derive equal benefits, and not be considered deprived, by hiking in the mountains instead if he does not live near the beaches.

Second, recreation is the only authorized purpose for which the consumer travels to the resource rather than having it delivered to him as is the case with water, power and, in a way, flood protection. This introduces great flexibility in the service area definition and adds to the substitutability of the commodity.

Third, and perhaps most important to this chapter, recreation is not a highly technological field. The data is incomplete, inconsistent and often subjective and the output of any analysis must be viewed in that light. Nevertheless, this chapter is analytical to the extent permitted by the data and its primary purpose is to quantify recreation demand and supply within the recreation service area. More qualitative aspects of the recreation experience at DWGNRA with and without a lake are discussed in Chapter XVIII.

The organization of this chapter follows a logical format of a supply/demand/needs analysis. The first section provides some historical background on outdoor recreation in America and attempts to analyze it. The second describes the present and future supply of facilities in the recreation service area, which is also defined in that section. The third section describes demand and demographic characteristics of recreation participants within the service area; and the final section compares supply and demand and projected needed future facilities.

IV.A. PREFACE: "FOR THE BENEFIT AND ENJOYMENT OF THE PEOPLE"

These words stand carved in stone at the north entrance of Yellowstone National Park. Today, after more than 100 years of the National Park System experience, many analysts see these words as the focus of a great dilemma; how can more and more of "the People," for whom the parks are preserved, continue to see them without damaging the natural qualities we seek to enjoy? Stated differently, this dilemma is a part of the traditional economic question of supply and demand as applied to recreation resources -- how can more and more demand for recreation be satisfied with the existing or created supply while maintaining the quality of the recreation experience.

IV.A.1. THE RECREATION MOVEMENT: AN HISTORICAL PERSPECTIVE

The Puritans who first settled in America disapproved of sports, games and amusements although they participated in many activities which were both communal or individual sources of enjoyment, such as quilting bees, county fairs, hunting and fishing. Continued immigration and prosperity brought an ever broadening range of recreation activities. Increases in the diversity of activities created a parallel increase in both public and private recreation spaces. Concert halls, theaters, taverns, and saloons became common expressions of indoor recreation demands. Fairgrounds, town commons, and playing fields became common outdoor recreation facilities.

Many of these activities took place in an apparently limitless expanse of open space or undeveloped land within easy walking distance of every village or city. The growth of the industrial city in the latter half of the 19th Century was to change the pre-industrial relationship between excessive supply and limited demand.

The transformation of open space to high density urban areas began to alarm some individuals participating in the fledgling Social Reform Movement before the end of the 19th Century. Central Park, America's first municipal park devoted to outdoor recreation, was born from the feeling of such reformers and the design talent of Frederick Law Olmsted in 1853. Olmsted stated that such an open space, composed of an "essentially rural landscape," complemented the city and provided "tranquility and rest to the mind." From this movement sprang the concept that recreation was a social good which might also be termed re-creation. It was this belief in open space as a necessity for social well-being that spurred the public involvement in the provision of parks and playgrounds. At the same time, Henry David Thoreau was saying "in wilderness is the preservation of mankind."

Most of the early examples of publicly supplied recreation areas were neighborhood playgrounds which provided highly disciplined and supervised activities. The purpose of the playgrounds was not only to protect the children from the heat, danger and dirt of the city and the immorality of the city streets, but equally to protect the adults from being annoyed by children who were taking part in unsupervised play.

Privately provided outdoor recreation areas catered more to the public's desire for amusement in a naturalistic rural setting. Privately developed amusement parks and "pleasuring grounds" were found on the outskirts of most urban areas by the turn of the century. These areas often provided facilities for swimming, picnicking, boating, music, dancing, and an assortment of rides. Still farther, but accessible by train, were numerous private resorts such as the Kittatinny House at the Delaware Water Gap. Here, guests consisted of well-to-do vacationers who came to enjoy the mountain air, the dramatic views, and the services of the elaborately equipped hotel.

The early 20th Century brought many changes. Higher living standards and the concessions won by the emerging Labor Movement resulted in an increase in leisure time and recreation demand. At the same time, new technologies drastically altered the mobility of the recreation seeker. Public transit and especially the private automobile created demand for regional, state and national parks.

Increased concentration of manufacturing and unsolved problems with disposal of waste products began to have secondary effects on water quality and water-dependent natural systems. As these systems began to deteriorate their recreation value was diminished. People who had the necessary mobility began to seek their enjoyment elsewhere. By the 1930's, many people could leave the city for open country. The two-week vacation with pay and the five-day work week provided sufficient time for excursions into the

countryside. The private recreation industry responded with such facilities as rental cottages for the longer vacationer and commercialized "scenic sites" for the weekenders or Sunday drivers. Providers of public recreation concentrated on expanded municipal park systems and evolved both the Recreation Movement and a professionalism with emphasis on organized programs and leadership.

The Depression was a positive influence on the public suppliers of recreation. As private suppliers found reduced attendance at their facilities, the demand for public recreation areas soared. Work Relief Programs employed thousands of persons to develop and expand the supply of recreation areas. The Second World War brought many of these development activities to a standstill and recreation demand was partially curtailed as the country pulled together to fight the enemy.

The post-war period saw marked changes in population, living patterns, mobility, disposable income and increased leisure time. Vacant land around the cities became suburbs. Rural areas, once nearby, were more and more distant. More and bigger roads and highways were a means for meeting the ever increasing recreation demands, while open space had to compete with increased demands for other socially important programs for funding priorities. Finally, in the 1960's, the lack and poor quality of recreation facilities in urban areas was cited as one of many important causes of civil disorders in the cities. Slowly, the social importance of re-creation is being re-acknowledged and park agencies are attempting to develop new

recreation opportunities near the concentrations of urban population. One important aspect of this effort is assessment of recreation demand and supply so that park planners respond with facilities to meet the most important needs.

This concern for recreation demand and supply is a logical consequence of planning in an atmosphere of scarcity. Still, the accuracy of any attempt to quantify these elements and project them into the future is both difficult and fraught with limitations. The following paragraphs will discuss the general context of demand, supply and needs for recreation while the specific methodology employed in this study and its results will be presented in following sections of this chapter.

IV.A.2. BACKGROUND ON DEMAND

Constant reference to demand for recreation has been made in the preceding sections. Simply stated, this demand is best defined as the amount and kinds of recreation opportunities or facilities consumed by the public. Demand is considered to be subject to variation with changes in leisure time, population size and composition, mobility, and income.

IV.A.2.(a) Leisure

The time available for recreation is an important determinant of demand. In the past, clear relationships between increased leisure time and increased

recreation demand have been observed. A recent study by the University of Michigan Survey Research Center entitled "Summary of the U.S. Time Use Survey" indicates that the average family now spends 20 percent of each work day on nonessential activities. Marion Clawson projects it to be 34 percent by the year 2000. Of the total leisure time available, some estimate as little as three or four percent is used for outdoor recreation. The remainder is used for a variety of other activities ranging from watching television to doing nothing. One trend does appear clear. Leisure time has been on the increase for the last several decades and is expected to continue to increase at least for the next few decades. The institution of the four-day work week, the concept of floating hours, and other efforts to liberate the worker from the narrow confines of "9 to 5" will all affect the total and daily amount of time available for recreation. The only question is how much more time and no one has been willing to hazard an estimate. Clawson does say that if the population in 2000 devoted from eight to ten percent of their time to outdoor recreation it would mean an increase of 40 to 50 times the total spent this way in 1960.

IV.A.2.(b) Population

The population of the study area is often considered to be the most important determinant of recreation demand. Not only the total number but population by age, sex, income, race, ethnic background, physical condition, distance from facilities, lifestyle, level of education and other demographic variables may be used to aid in planning for recreation.

The section on the history of recreation stressed the importance of urban growth on the reduction of available open space. It is important to emphasize that fact once again. In 1770, the four million people in the U.S. lived in a predominately rural setting. In 1970, the 204 million people lived in a predominately urban environment. Over 70 percent of Americans live on ten percent of the land.

One other factor in the urban population is noteworthy. Blacks comprise 11 percent of the total population and 60 percent of all blacks live in the central cities. In addition, their median income is about half that of whites. The reformers of the early part of this century, who saw recreation as a social necessity, would still be concerned for the lack of outdoor recreation opportunities in our urban areas.

Population is also expected to grow between now and 2000. Estimates vary along three general assumptions: the historical trend of past growth projected into the future; sound economic growth, which assumes technological answers to such factors as resource scarcity, environmental problems, and energy; and limited growth, which assumes approaching zero population growth and maximum emphasis on the conservation of resources.

IV.A.2.(c) Mobility

The ability to travel to more distant open areas was cited earlier as the means of expanding recreation supply as our urban areas grew and filled previously open rural land. Transportation is an important factor in

recreation demand analysis. It determines the travel time and thus the remaining real recreation time. It costs money and thus influences who may participate in distant recreation facilities, and transportation can drastically affect the quality of the recreation experience. Thus the enjoyment of a day at the seashore can be ruined by the traffic jam on the way home.

Perhaps the most important recent development in transportation is the growing concern for energy and especially the current and expected increases in the cost of gasoline. As such costs increase it is reasonable to expect recreation related travel in private autos to decrease. Some indications of this have already been noted as ski resorts began to offer bus service to and from urban areas in the Northeast in 1973-74. This development will mean an increase in importance of three elements: recreation facilities near the concentrations of population; inexpensive public transit to and from recreation areas; and larger scale units of recreation facilities which would provide common recreational destinations for greater numbers of people, hence making public or mass transit possibly more efficient and attractive.

IV.A.2.(d) Income

The availability of money to spend on recreation is another influence on demand. However, the importance of recreation for social welfare is difficult if not impossible to put into dollar terms. As income is less, so the amount for recreation related consumption is less. But does the need for recreation diminish with reduced income? If anything, the indications are that the opposite is the case. The more affluent can afford to spend their time in more attractive surroundings and to pursue other leisure time diversions.

Estimates are that real income will also continue to increase. Clawson and Knetsch in their book Economics of Outdoor Recreation stated that in the year 2000 money available for outdoor recreation will be eight times what it was in 1960. They also estimated that we might spend 40 to 50 times as many hours on outdoor recreation in 2000 as in 1960. This could mean that even the affluent would have less than one-fifth the money to spend on outdoor recreation per unit of time.

Another consideration is that real income may not continue to increase as has been projected. Indeed if a projection were made on the basis of the last several months rather than the last several years one might find the real income could be expected to decrease although, as discussed in Chapter I, this is not the projection of this study. Inflation, recession and increased costs of living are taking a toll on income available for recreation.

IV.A.2.(e) Participation

Actual participation in outdoor recreation is often used as an indication of demand. The use of participation presents one important limitation. While it may be the best source available for information on numbers of people participating in specific activities, it is a measure of current consumption and not demand. One of the first rules of market analysis is not to confuse consumption with demand; however, some recreation planners are often guilty of necessarily violating this rule. The available data, while often incomplete, does give an important indication of use and relative preference by types of facilities, service area and demographic characteristics.

place. Even so, current participation information is generally the only activity specific source of data available and is a useful guide for demand analysis as long as the above limitations are understood.

IV.A.3. BACKGROUND ON SUPPLY

The basic issue for the supply of recreation opportunities is not one of total numbers of acres or facilities but rather the imbalance of available opportunities. The West has 72 percent of the acreage designated for public outdoor recreation and 15 percent of the population. On the other hand, the Northeast, with 25 percent of the population, has but four percent of the available recreation land.

The classic economic model for analysis of recreation needs is to estimate the recreation demand, tabulate the existing supply of recreation opportunities, and subtract supply from demand to give an approximation of needed new facilities to meet the existing and projected demand. While the analysis of recreation demand is complex and fraught with the limitations discussed in the preceding section, the tabulation of existing supply is somewhat more straightforward. Still there are important difficulties with any analysis of existing facilities. These difficulties include a lack of comparable data on facilities. Acreage by use, seasonal variation, units of measurement, overlapping or multiple uses, and differing definitions from jurisdiction to jurisdiction all present problems in the inventory of outdoor recreation facilities.

In addition to the data difficulties is the fact that recreation is provided by both public agencies and private enterprise. Information on privately supplied recreation facilities is generally less available than for public facilities. This distinction between private and public, deserves considerable discussion. It has generally been thought that private industry is the single most important force in outdoor recreation. Some analysts debate this premise on the basis that there are a number of reasons why private capital investment in recreation is both limited and unwise. Several factors reduce the attractiveness of recreation as an investment:

1. Recreation is a seasonal activity. Too often the cost of full-time capital must be amortized in a 100-day season.
2. Initial capital investment is generally high.
3. The consumer can forego expenditures on recreation with relative ease, so it is among the first items to be trimmed from the family budget when times get tough.
4. Many forms of recreation require a high labor input.
5. Recreation is often subject to capricious and unpredictable changes in the public's taste.
6. Fear of competition from public agencies who provide subsidized recreation facilities further inhibit private investment.

   Still, private recreation facilities are immensely important, accounting for approximately five percent of disposable income.

The public provision of recreation facilities is a response to the earlier cited recognition of recreation as positive influence on social well-being.

Supply is often discussed in terms of its potential to respond to demand by accommodating users. This brings up other vexing issues, the estimation of existing use and site capacity. Data on existing use of most recreation facilities, not requiring admission payment, is usually non-existent or subject to guesses which at best are made on the basis of the number of available parking spaces. While standards exist for the design of new facilities, sufficient research has seldom been done on specific facilities to know whether such standards are exceeded or not; analysis presented later in this chapter suggests that they often are.

Therefore, an analysis of existing supply can provide valuable information on the type and size of facilities. Information on actual use is less precise, but a range of sources provides data on visitation and intensity of use for various facilities.

Recent attempts to understand use and respond to the question of increased demand as it may influence limited supply have focused on the concept of carrying capacity, or the ability of a facility or area to transmit its attributes or essence to users. When exceeded, the essence of the site or experience is lost. Assuming a sufficient demand to use a facility to capacity, carrying capacity may be divided into three types.

Physical Carrying Capacity: This aspect is a measure of the effect of use on the nonliving aspects of the site. The ability of a particular terrain to resist trail erosion is one example. Soil, slope and weather are the most important elements in determining physical carrying capacity.

Ecological Carrying Capacity: The effect of visitors on the living aspects of the site are also an element of carrying capacity. When the natural plant and animal features of the site are substantially altered the capacity is exceeded. One measure is the ability to dispose of visitor wastes without doing damage to the living features of the site.

Psychological Carrying Capacity: This aspect deals more with the expectations and desires of the visitors and may be the most critical component of carrying capacity as this is the determinant of the perceived quality of the recreation experience.

The preceding discussion of recreation supply and demand has been intended as an introduction to the subject matter to be covered in this chapter. Its purpose has been to provide the reader with some general background on the subject, and to point out some of the difficulties and limitations of the data and methods used to analyze and present the specific information on the supply of existing opportunities and demand in the service area.

IV.B. EXISTING AND PROGRAMMED SUPPLY OF RECREATION FACILITIES

This section discusses the supply of recreation facilities within the recreation service area for the Tocks Island Lake Project. Both quantitative and qualitative aspects of the supply are discussed as determined from sources ranging from computer printouts of government surveys to direct field observation and interviews. The section is organized in four major parts. The first describes the data collection process, sources and limitations. The second discusses various characteristics of the supply and its distribution within the service area. The third discusses various standards and ratios used to measure the adequacy and capacity of facilities and measures the total capacity of the inventoried facilities. And finally, the fourth part discusses major planned additions, other than DWGNRA itself, to the supply of facilities within the recreation service area.

IV.B.1. DATA COLLECTION

IV.B.1.(a) Scope of Data

Recreation facilities data have been limited to the range of key water and land based facilities relevant to the Tocks Island Lake Project. Thus the scope of data collected for the recreation service area was limited to swimming, boating, fishing, camping, picnicking, hiking and hunting.

Swimming data was collected for all salt and fresh water beaches. Boating was limited to fresh water acres because of comparability to the type of boating to be provided by TILP.

Swimming pool water area by square foot was collected for all public and private pools in recreation service areas. Not included in the totals are private backyard pools of either the above ground or below ground type. These are assumed to absorb a very limited percentage of total swimming demand, disproportionately smaller than their water area, due to their relatively low utilization rates. However, their approximate contribution to overall capacity is discussed later in this chapter.

Data on overnight campsites was collected for the entire recreation service area but not group campsites because they do not fit within the same supply-demand relationship as the other activities. Campsites include both primitive (without plumbing or fireplaces) and developed sites, and those with and without vehicle access. Included are sites for tents, camper trucks and motor homes. Campsite capacity and distribution can indicate the extent of overnight visitations versus day trips in a particular county.

Hiking and nature trail mileage was determined because of their abundance within DWGNRA and the surrounding counties. Hiking and nature trails only were tallied due to the conceptual difficulty of separating other trail usage including snowmobiling, all-terrain vehicles and equestrian usage.

Additionally, it is assumed that hiking and nature activities will be the key DWGNRA trail uses. Bicycle trails are not included for the above reasons and also because it is impossible to determine the percentage of bicycling done on neighborhood streets and rural byways as opposed to that done on special bicycle paths.

Hunting is an especially important recreational use because of the extensive land utilization involved. Vast woodland and meadow acreage is bound by hunting and fishing rights. Big and small game hunting and stream fishing are activities commonly found in public fish and game areas as well as private rod and gun clubs. Hunting occurs extensively throughout the recreation service area and constitutes the single greatest recreation use of acreage in the seven counties surrounding TILP-DWGNRA.

Picnicking areas are included because of the pervasive popularity of this activity. Picnic areas constitute a major destination of recreation day trips, and are often found in conjunction with other facilities.

No information has been collected on indoor recreation as it is assumed this will be virtually nonexistent in DWGNRA.

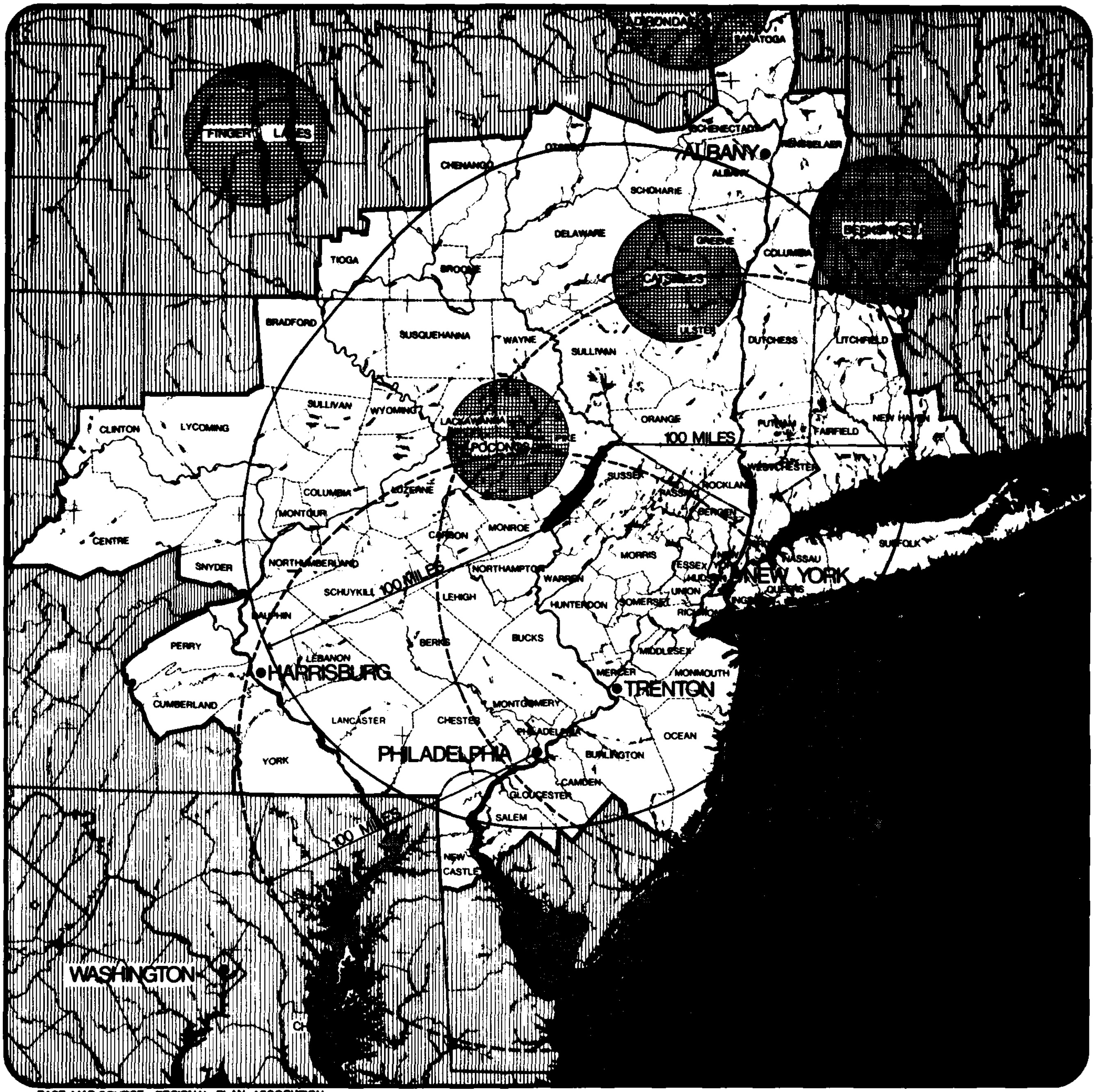
IV.B.1.(b) Service Area Definition

The recreation service area is principally defined by two criteria: 100 miles radius from the center of DWGNRA (midway between Stroudsburg and Port Jervis on the Delaware River), or 2.5-hour driving time from this point, whichever is greater. The area thus defined contains 81 counties

in five states, with a total 1974 population of approximately 29,730,000. Included are the first and fourth largest urbanized regions in the United States, New York with 11,500,000 people and Philadelphia with 3,500,000.

For statistical convenience, any county which was covered in any part by this radius was included in its entirety and as a consequence some counties shown in the table below are indicated to be further than 2.5 hours away from Tocks Island. This must be considered within the context of what a service area is. It is not a hard definition which describes absolutely the only area from which visitors to DWGNRA will come. DWGNRA may get one visitor a year from Afghanistan, ten from California and 50 from Illinois. Therefore, it is customary to think of service areas (whether for recreation, retail, banks or whatever) as a contiguous area providing some set percentage of the expected patronage of the facility with the rest of the world being treated as "inflow" to the service area. Examination of the New York State travel statistics indicates that by reducing the travel radius to two hours from 2.5 would only increase the residual inflow figure from 10 to 12 percent. Obviously, this indicates marginal efficiency in close examination of counties at the outer edge of the ring.

Furthermore it should be apparent that the service area for each activity might be different. Therefore the service area should be thought of as a statistical framework for evaluating present and future demand and supply. The table below shows the 81 counties (grouped to match demographic data used elsewhere in this study) which comprise the recreation service area and the time from their population centroid to Tocks Island Lake.



BASE MAP SOURCE: REGIONAL PLAN ASSOCIATION

0 16 32 48
SCALE IN MILES

N

RECREATION SERVICE AREA

IV
1

LEGEND

- LIMITS OF DELAWARE WATER GAP NATIONAL RECREATION AREA
- 100 MILE RADIUS OF DWGNRA
- 100 MILE RADII OF NEW YORK AND PHILADELPHIA
- AREA BEYOND THE RECREATION SERVICE AREA
- REGIONAL COMPETITIVE RECREATION AREA

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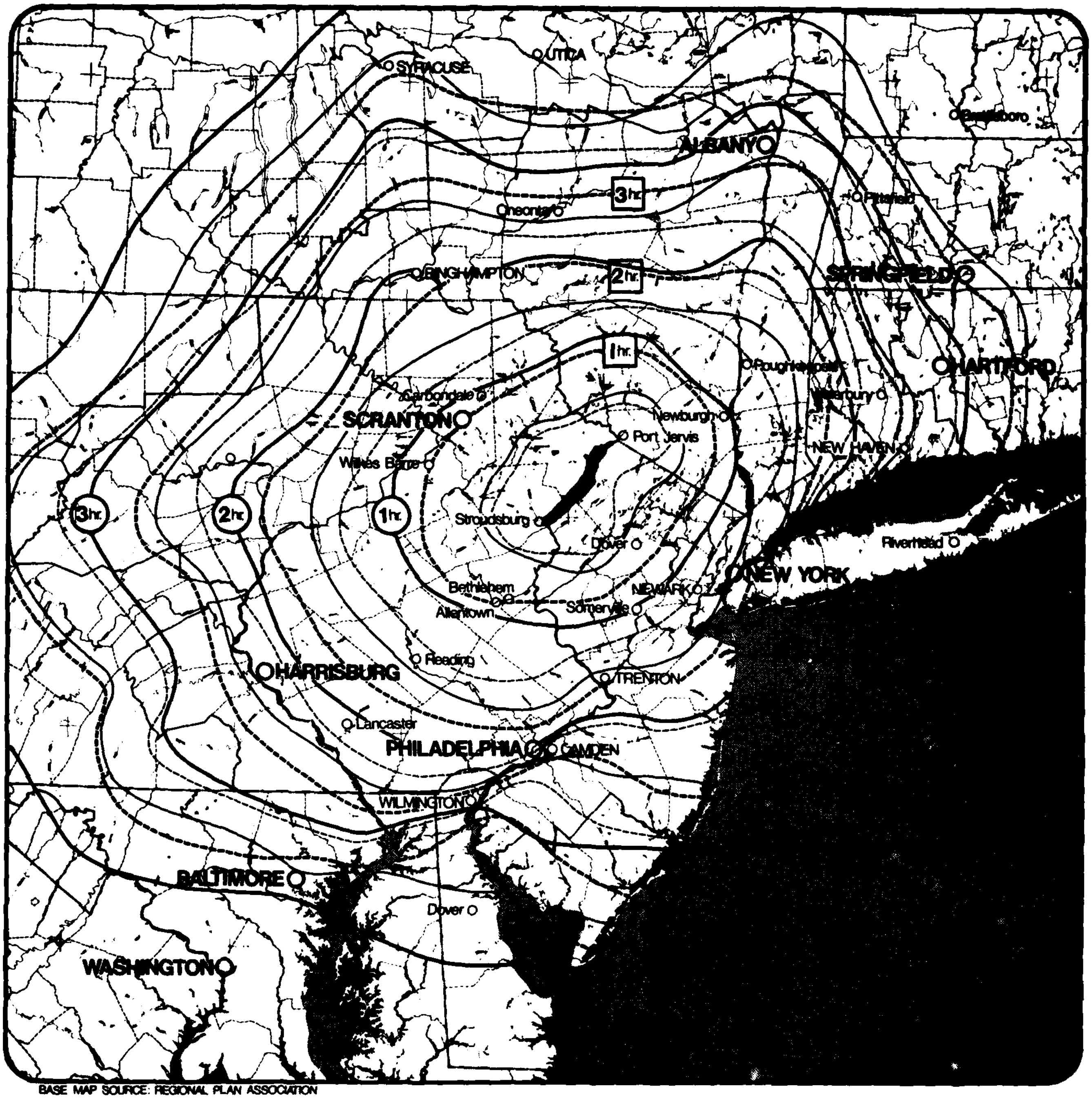

BASE MAP SOURCE: REGIONAL PLAN ASSOCIATION

0 15 30 45
SCALE IN MILES

N

AUTO TRAVEL TIMES
FROM DWGNRA

IV
2

LEGEND

TIME CONTOURS

PEAK HOURS: $\boxed{X}$

- - - - - HOURLY CONTOURS
- - - - - HALF HOURLY CONTOURS

NON PEAK HOURS: ⓧ

——— HOURLY CONTOURS
——— HALF HOURLY CONTOURS

LIMITS OF DELAWARE WATER GAP NATIONAL RECREATION AREA

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TOCKS ISLAND LAKE PROJECT & ALTERNATIVES
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Table 4-2 Travel Time From Tocks Island Lake to Counties in the Recreation Service Area

	Minutes
PENNSYLVANIA COUNTIES	
Berks	115
Bradford	135
Bucks	100
Carbon	50
Centre	200
Chester	140
Clinton	175
Columbia	100
Harrisburg SMSA 1/	160
Lackawanna	60
Lancaster	170
Lebanon	130
Lehigh and Northampton	50
Luzerne	70
Lycoming	150
Monroe	15
Montgomery	100
Montour	110
Northumberland	135
Philadelphia and Delaware	120
Pike	15
Schuylkill	105
Snyder	165
Sullivan	140
Susquehanna	95
Union	135
Wayne	40
Wyoming	85
York	195
NEW JERSEY COUNTIES	
Bergen	70
Essex	75
Hudson	85
Hunterdon	45
Mercer	80
Middlesex	80
Monmouth	115
Morris	60

	Minutes
NEW JERSEY COUNTIES (Con't)	
Ocean	125
Passaic	50
Phila. SMSA-New Jersey 2/	125
Salem	165
Somerset	60
Sussex	20
Union	85
Warren	20
NEW YORK COUNTIES	
Albany SMSA 3/	145
Broome and Tioga	125
Chenango	175
Columbia	135
Delaware	145
Dutchess	95
Greene	105
Nassau and Suffolk	160
New York City 4/	100
Orange	25
Otsego	180
Putnam	105
Rockland and Westchester	90
Schoharie	155
Sullivan	45
Ulster	70
CONNECTICUT COUNTIES	
Fairfield	115
Litchfield	135
New Haven	135
DELAWARE COUNTIES	
New Castle	150

1/ Cumberland, Dauphin and Perry.
2/ Burlington, Camden and Gloucester.
3/ Albany, Rensselaer, Saratoga and Schenectady.
4/ New York, Bronx, Kings, Queens and Richmond.

The historical basis for the recreation service area definition is contained in the Robert R. Nathan Report, Potential Impacts of the DWGNRA on its Surrounding Communities, February 1966. This report determined that approximately 80 percent of DWGNRA users will reside within 2.5 hours drive or 100 miles, the maximum comfortable distance for a nonpeak day outing. The consultants have updated the 2.5-hour drive to reflect the significant additions to the Interstate highway system constructed since 1966. The area thus defined includes the 33 Pennsylvania counties, 18 New Jersey counties, 26 New York counties, three Connecticut counties and one Delaware county, shown in the table above.

By selecting a service area which is at least 2.5 hours away from Tocks Island at its outer edge, and in some cases more than three hours away, the influence of competing supply opportunities outside of the service area is minimized. The survey data discussed later in this chapter indicated the rapid fall-off of participation with distance. For example, of all swimming activities (as measured by activity days) only 9.4 percent take place more than 2.5 hours from the participant's home; the figure for boating is 18 percent, hunting and picnicking are both 9.3 percent. Only for camping (29 percent) does the figure exceed 20 percent among 12 activities tabulated. By using such a "travel-time-decay" factor in the analysis, the relative location of Tocks Island Lake and DWGNRA compared to competing locations is accounted for whether this competition lies within the recreation service area or not.

IV.B.1.(c) Service Area Description

Recreation facilities comparable to those in DWGNRA are found throughout the 81-county recreation service area with certain noteworthy concentrations. The Catskill (Sullivan, Ulster and Orange counties, New York) and Pocono (Monroe, Pike, Carbon and Wayne counties, Pennsylvania) mountains have numerous facilities for camping, freshwater swimming and boating). The New Jersey shore (Monmouth and Ocean counties) and Long Island Shore (Nassau and Suffolk counties) both exhibit significant concentrations of saltwater beaches and boating. Primary freshwater bodies include the Hudson and Delaware rivers, Lake Wallenpaupack, Lake Hopatcong and Greenwood Lake, among others. Neither river is extensively used for boating or swimming due to water quality problems and limited access and most of the lakes are private. Both rivers provide extensive scenic corridors used for day trips from major urban centers.

Areas beyond the recreation service area contain significant amounts of recreation facilities. The Allegheny Mountains to the west, in Pennsylvania, provide abundant swimming, boating, camping and hiking. To the north, the Adirondack Mountains in New York do the same, as do the Berkshires in Connecticut and Massachusetts. Coastline areas also offer significant swimming and boating facilities. The Long Island south shore, from New York City to Montauk Point, and the New Jersey shore from Sandy Hook to Cape May, provide continuous beachfronts. Boating occurs along these beaches, as well as in Long Island Sound, the Delaware Bay and Chesapeake Bay.

The above areas are noteworthy in that they offer competing destinations within a 2.5-hour drive of outer portions of the recreation service area. Of course, a Philadelphia family may choose to swim at Cape May, an Albany family might choose to camp in the Adirondacks, and a Harrisburg family might choose to hike in the Alleghenies -- all outside of the defined recreation service area. Major competing attractions within the 2.5-hour range of the outer edge of the service area include the Adirondacks, the Berkshires, the southern New Jersey beaches, the Finger Lakes region and the Chesapeake Bay; but these are each competitive for separate portions of the service area.

IV.B.1.(d) Data Collecting Methodology

Using most recent data, total supply, public and private was determined with public sources including state and federal facilities. Private sources were taken from a Soil Conservation Service survey done in 1974. Both public and private sources are compiled in printouts. Data was obtained from Pennsylvania's Office of State Planning and Development and Department of Environmental Resources, and the New York State Office of Parks and Recreation; New Jersey public data was compiled from the Bureau of Outdoor Recreation's survey data compiled during 1972, and the New Jersey Statewide Comprehensive Outdoor Recreation Plan. BOR data was also used for Connecticut and Delaware public facilities.

Public facilities totals were checked within counties by comparison with recreation facilities summary printouts provided by the Tri-State Planning Commission (New York City metropolitan counties) and Delaware Valley Regional Planning Commisssion (Philadelphia metropolitan counties). Additionally, New York and Pennsylvania facilities totals were checked against BOR totals.

IV.B.1.(e) Definitions and Sources

Significant difficulties were encountered in acquiring comparable data consistent within the recreation service area. Because of the vast quantities of small facilities, varying dates of surveys, and count accuracy, different sources gave different totals. Data category definitions were carefully examined for comparability between states. Thus, while every attempt was made to make data internally consistent, limitations still exist. For example, Soil Conservation Service data, which forms the basis of all private sector counts, varies in completeness and accuracy by county. Generally it is most accurate in rural counties where most outdoor recreation facilities are found. BOR data on public sectors provides low totals due to relatively weak response to original 1972 questionnaires by local and county governments. Such omissions, while distorting the statistical analysis of the data, are generally of facilities which are not comparable to or competitive with the proposed DWGNRA. The recreation facilities inventory data includes totals for public and private facilities for key land and water based recreation facilities. These totals, broken down by county and facility type, have been derived from the most currently available information. Specifically, data sources include:

New York State

New York State Office of Parks and Recreation, Albany, New York, 1975 computer printout for public and private land and water based facilities, and Land Use and National Resources (LUNR) data for water acreage.

New Jersey

U.S. Bureau of Outdoor Recreation, Washington, D.C., 1972 computer printout for public facilities; New Jersey Statewide Comprehensive Outdoor Recreation Plan; and U.S. Soil Conservation Service, Somerset, New Jersey, 1974 survey sheet summaries for private facilities.

Pennsylvania

Pennsylvania Governor's Office of State Planning and Development, Harrisburg, Pennsylvania, 1975 computer printout for public and private facilities; U.S. Bureau of Outdoor Recreation, Washington, D.C., 1972 computer printout for public water acreage; and U.S. Soil Conservation Service, Harrisburg, Pennsylvania 1974 summaries for private water acreage.

Connecticut

U.S. Bureau of Outdoor Recreation, 1972 computer printout of public facilities; private recreation facilities totals were not obtainable for the State of Connecticut.

Delaware

Same as above for Connecticut without private recreation facilities; 1972 Bureau of Outdoor Recreation data.

The data derived from the above sources has been broken down into the following categories on a consistent basis for the entire recreation service area.

Land Based Facilities

Picnic tables: Total quantity

Campsites: Total sites including primitive and developed types for both recreation vehicle and tenting facilities; group camping facilities are not included.

Trails: Nature and hiking trails only, in total miles; biking, horseback riding, snowmobile trails are not included.

Hunting preserves: Total acres for both big and small game areas.

Water Based Facilities

Swimming beaches: Total lineal feet.

Swimming pools: Total square feet of water area.

Boating: Total freshwater acres -- lakes, ponds, reservoirs and major rivers.

Fishing: Total water acres as for boating; stream fishing has not been included due to incomplete data.

Base data for freshwater boating and fishing acreage is least consistent from state to state. Pennsylvania and New Jersey data is specifically identified as recreation use. The New York data, provided from the Land Use and Natural Resources computerized survey, gives total water acreage (excluding saltwater bays and sounds). Accordingly, the New York totals in Table 4-7 include bodies of water which are not available for recreation such as extensive acreage on closed or severely restricted reservoirs. The capacities in Tables 4-14, 4-19 and 4-39 have been reduced by a factor similar to that of New Jersey in order to more closely reflect recreation use of water surfaces.

The limitations and possible omissions do not impair the usefulness of the base data since in most cases the omissions are minor or offsetting adjustments have been made in the demand estimates. Furthermore, the difficulties inherent in using secondary source data are fairly uniform throughout the service area so the relative distribution of facilities is minimally affected. And while county-by-county figures are presented and specific discrepancies may be pointed out, the conclusions drawn in this chapter are based more on aggregate figures and broad distribution patterns.

IV.B.2. CHARACTERISTICS OF THE SUPPLY OF RECREATION FACILITIES

This section of the chapter discusses some of the characteristics of the supply and its utilization within the service area. Both the distribution of facilities within the area and by public and private responsibility are discussed; facility concentrations are compared with population concentrations and several specific major facilities or types of facilities are described. Fuller description of the utilization of selected facilities most comparable to DWGNRA is discussed later in Section IV.C. of this chapter.

IV.B.2.(a) Relative Distribution of Facilities by State and County

The distribution of recreation facilities by state indicates relative areas of surplus and deficiency. Data from which this description is derived is illustrated in Figures 4-6 and 4-7 and in facility inventories by state and county in Tables 4-3 through 4-13.

The discussion by states is restricted to portions of each state within the recreation service area. Therefore, the entire states of Pennsylvania, New York, New Jersey, Connecticut and Delaware are not included. The relative sizes of each state which fall within the recreation service area must also be taken into consideration.

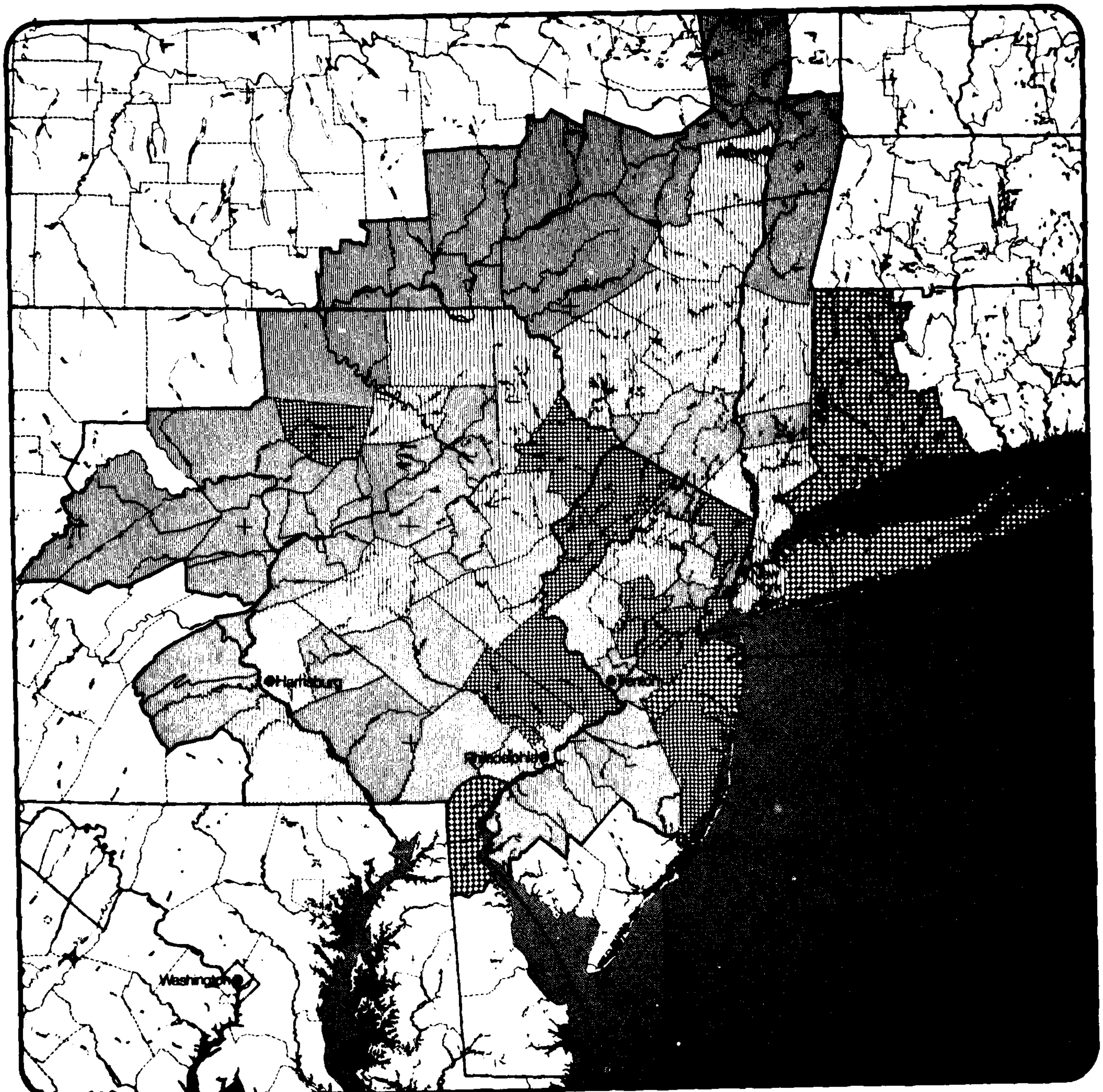
Nevertheless, certain distinctions can be noted. Pennsylvania, which has no Atlantic seacoast, has a small percentage of the beach capacity but

easily the greatest number of swimming pools. The large pool capacity is then reflected in Pennsylvania's largest percentage of total swimming capacity. Pennsylvania also contains the largest percentage of the total campsites, biking trails, picnic sites and hunting acres.

Because of relative size and existence of facilities and natural resources, New York also has large percentages of campsites and picnic tables, though only half as many hiking trails as Pennsylvania, and one-third the hunting acreage. New York, however, has the greatest potential boating and fishing acreage. Included in the New York inventory are approximately 68,000 acres of the Hudson River which significantly increases the boating potential, though may not actually be utilized to the same boating capacity standards as would be an accessible clean water lake or reservoir.

For the entire recreation service area, no pattern relative to population or geographical size or number of counties exist. Rather, natural determinants such as the presence of shore line (whether salt or fresh water) or mountains dictates relative supply mix among states. The more urbanized areas have more pools and less hunting acreage. Specific findings for various facility types are discussed below and the percentage distribution by county within each state for swimming, boating and camping is illustrated in Figures 4-3 through 4-5.

Picnic Tables: Pennsylvania has the most picnicking due to the existence of the extensive state park system, 51.2 percent



BASE MAP SOURCE: REGIONAL PLAN ASSOCIATION

0 16 32 48
SCALE IN MILES

N

DISTRIBUTION OF STATE SWIMMING CAPACITY IN RECREATION SERVICE AREA BY COUNTY

IV 3

LEGEND

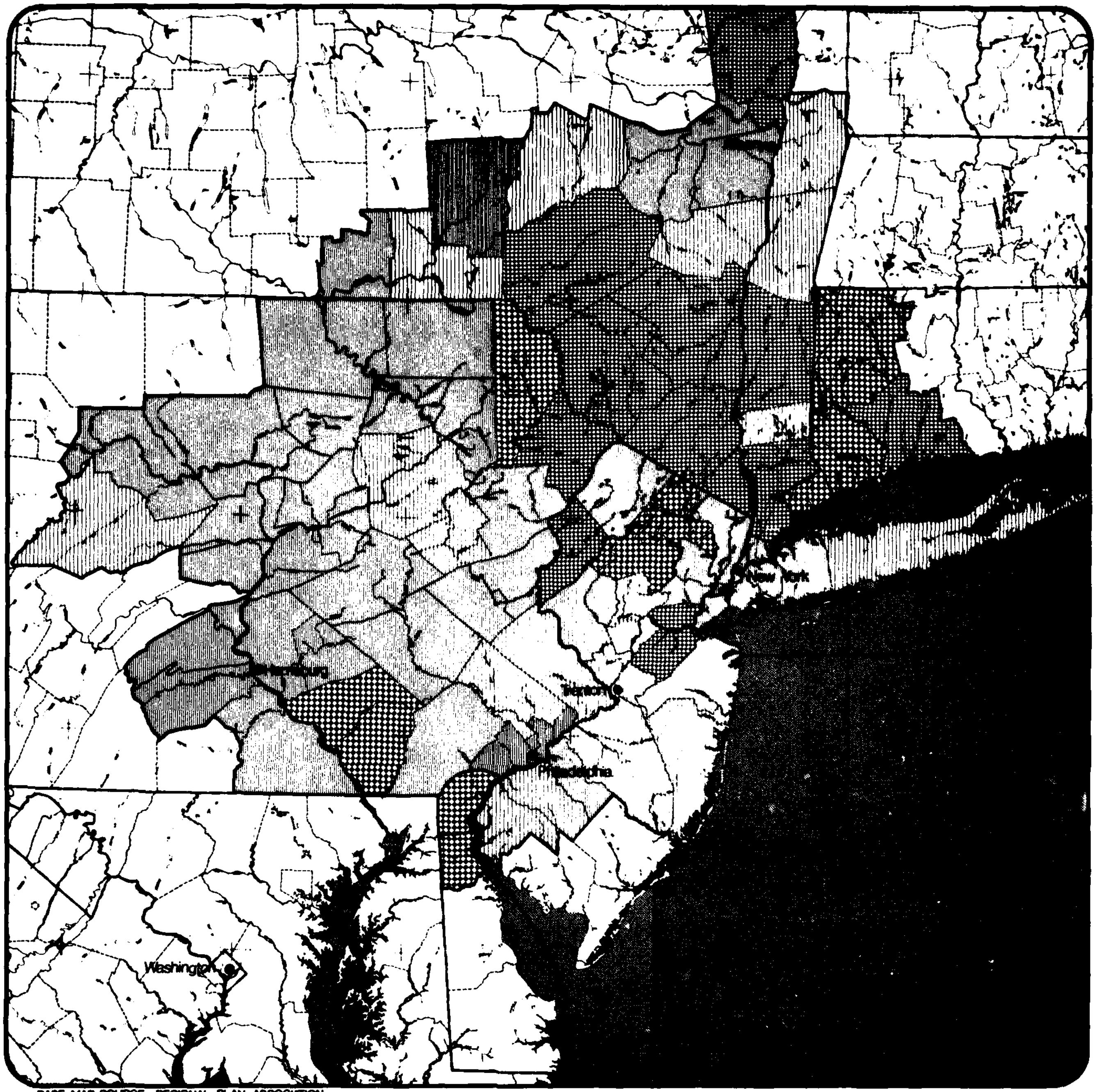
PERCENTAGE OF TOTAL IN-STATE FACILITIES

- 0 - 2.5
- 2.5 - 5.0
- 5.0 - 15.0
- 15.0 +

A COMPREHENSIVE STUDY OF THE

TOCKS ISLAND LAKE PROJECT & ALTERNATIVES

URS / MADIGAN-PRAEGER, INC. & CONKLIN AND ROSSANT



BASE MAP SOURCE: REGIONAL PLAN ASSOCIATION

0 16 32 48
SCALE IN MILES

N

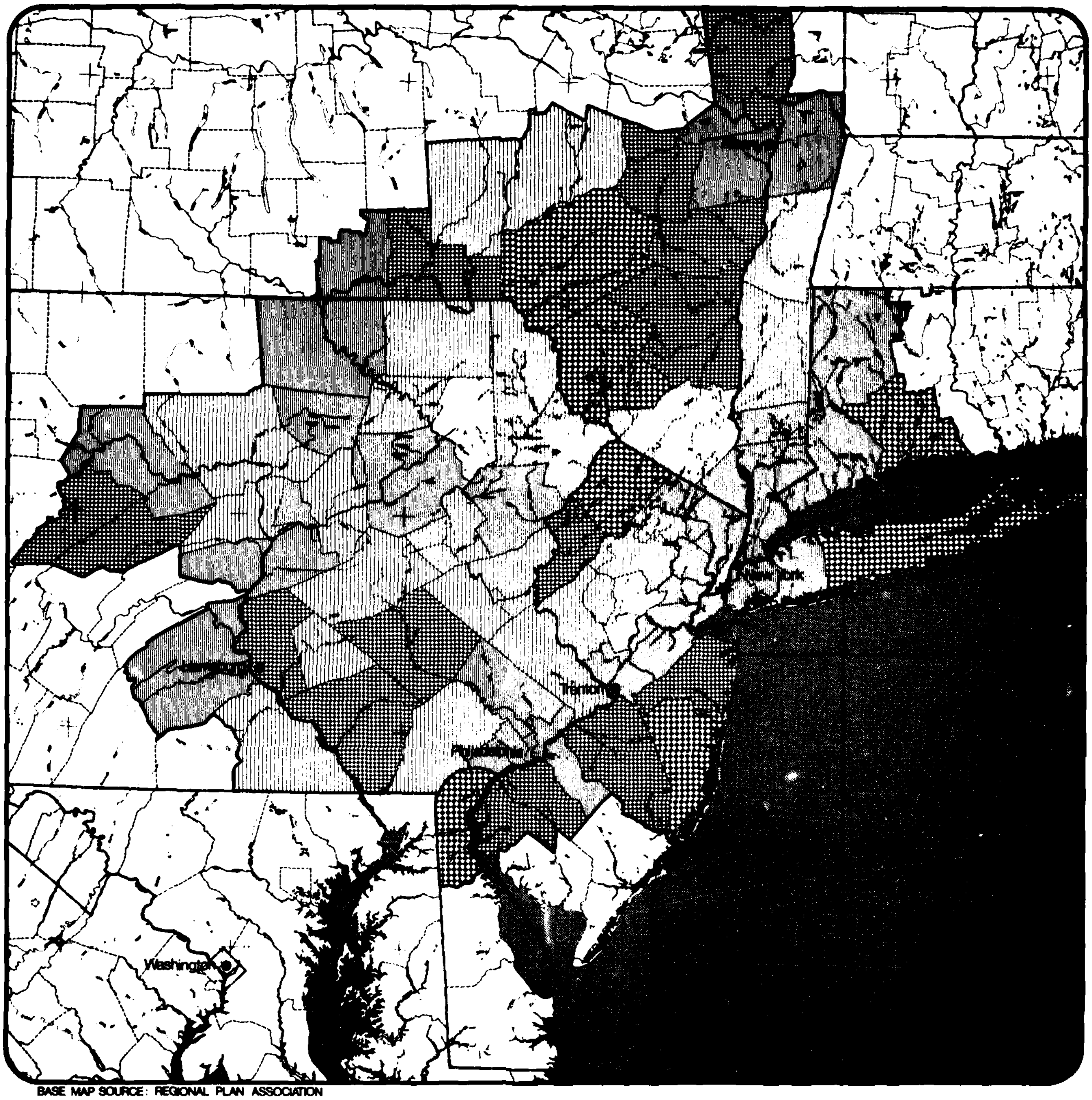
DISTRIBUTION OF STATE FRESH WATER BOATING CAPACITY WITHIN RECREATION SERVICE AREA BY COUNTY

IV 4

LEGEND

PERCENTAGE OF TOTAL IN-STATE FACILITIES

- 0-2.5
- 2.5-5.0
- 5.0-15.0
- 15.0 +



BASE MAP SOURCE: REGIONAL PLAN ASSOCIATION

0 16 32 48
SCALE IN MILES

N

DISTRIBUTION OF STATE CAMPSITES WITHIN RECREATION SERVICE AREA BY COUNTY

IV
5

LEGEND

PERCENTAGE OF TOTAL IN-STATE FACILITIES

- 0-2.5
- 2.5-5.0
- 5.0-15.0
- 15.0 +
- FIGURES NOT AVAILABLE

of the recreation service area total. New York and New Jersey have less, with 40.2 percent and 7.7 percent, respectively. It should also be assumed that much picnicking occurs on boats and on beaches in shore line areas and in rural areas without specific table sites.

Campsites: Pennsylvania has the largest portion with 45.3 percent of the campsites. New York has 38.9 percent with one-third of that in the Catskills. New Jersey has only 14.3 percent of the recreation service area's total campsites.

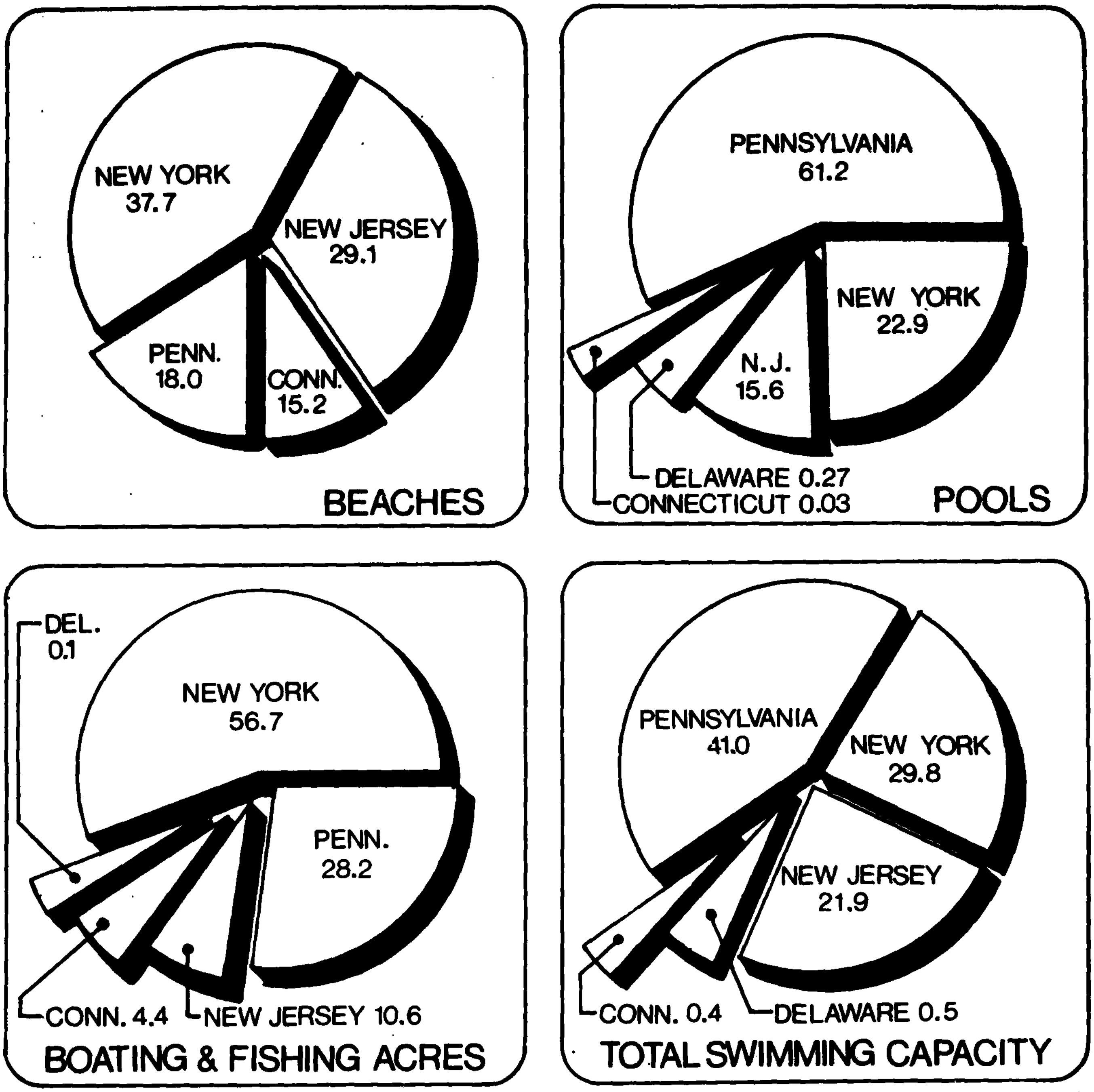
Beaches: Within the recreation service area, New York, New Jersey and Connecticut have extensive sound and ocean beaches and there are many lake beaches throughout the entire region. New York has the largest percentage (37.7 percent) of the beach footage including Long Island's Atlantic Ocean and Sound beaches encircling Nassau and Suffolk counties. New Jersey has 29.1 percent, its largest percentage of any of the inventoried activities. These include extensive Atlantic Coast beaches in Monmouth and Ocean counties. Connecticut, too, has many miles of beaches on Long Island Sound which gives Connecticut 15.2 percent, the highest for Connecticut in any category.

Pools: Most of the pools are in Pennsylvania (61.2 percent), which reflects the lack of beaches (only 18 percent of recreation service area beach footage).

<u>Trails</u>: Most trails are found in Pennsylvania (62.2 percent) and in New York (31.8 percent), and there are few trails found in New Jersey (5.2 percent). Most trails are located in mountainous areas.

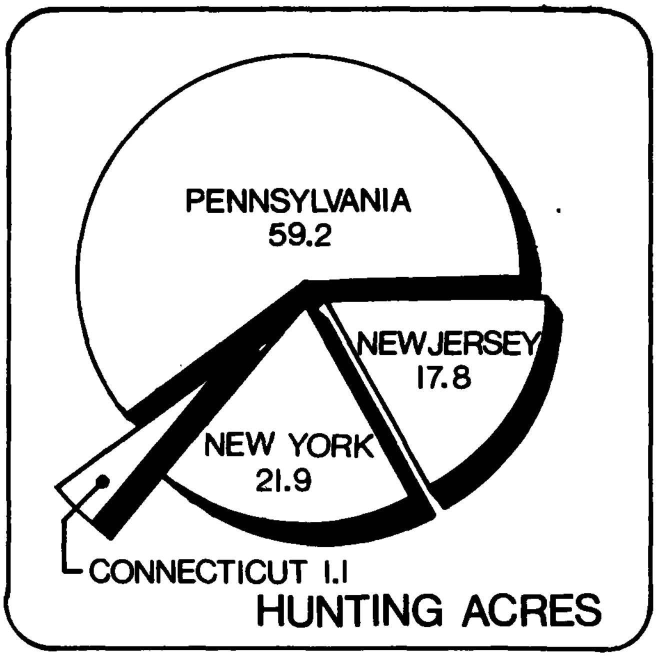
<u>Hunting Acres</u>: Vast acreage exists in all three states. Pennsylvania has the most (59.2 percent) with New York and New Jersey roughly comprising equal proportions of recreation service area totals, 21.9 percent and 17.8 percent, respectively.

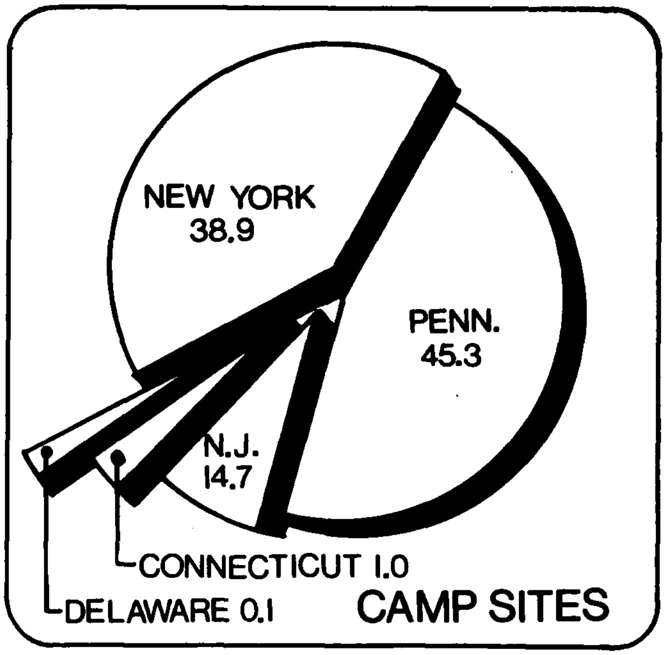
The foregoing discussion of facility distribution by state within the recreation service area is illustrated in the following "pie graphs." These categories of facility types are inventoried by county in Tables 4-3 through 4-10 which follow the graphs. Tables 4-11 through 4-13 display data from the 1972 BOR survey relating to planned additions to the supply, but this information was not used directly in the supply analysis.

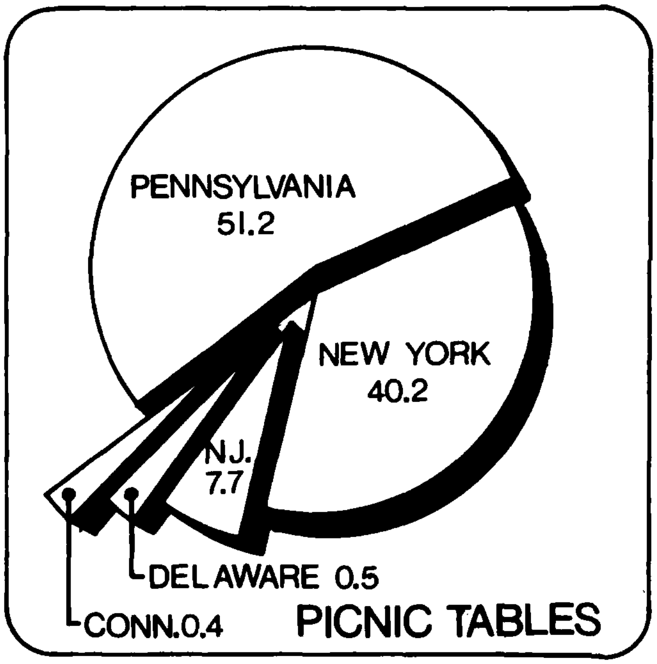


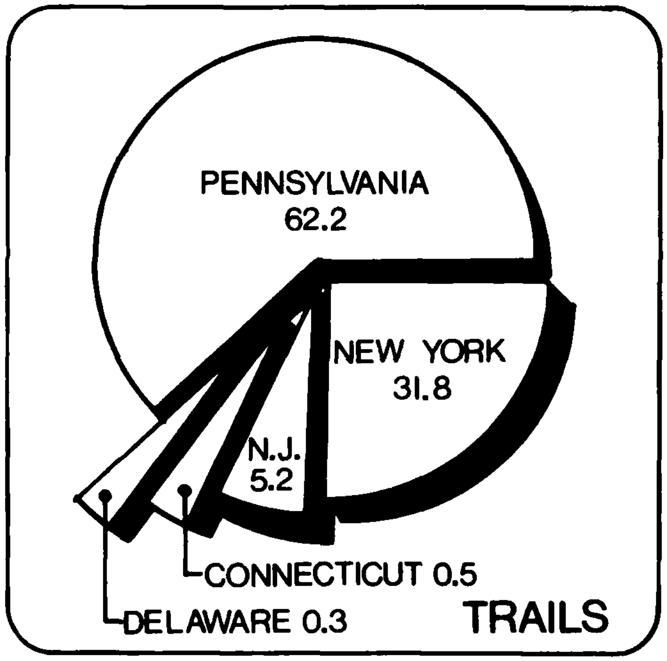
WATER BASED FACILITIES 6 IV

STATE TOTALS AS PERCENTAGES OF FACILITY TOTAL WITHIN RECREATION SERVICE AREA.









LAND BASED FACILITIES 7 IV

STATE TOTALS AS PERCENTAGES OF FACILITY TOTAL WITHIN RECREATION SERVICE AREA

Table 4-3 Inventory of Recreation Service Area Pennsylvania Water Based Recreation

(Source: Pennsylvania Office of State Planning and Development - 1975)

County		Beaches (Linear Feet)	Pools (Square Feet of Area)	Freshwater Boating (Water Acres)*	Freshwater Fishing (Water Acres)*
Berks	Public	1200	169000	1241	1241
	Private	-	119000	39	39
Bradford		200	24000	304	304
		300	42000	320	320
Bucks		-	222000	-	-
		10000	585000	2023	2023
Carbon		2400	18000	1426	1426
		1000	20000	714	714
Centre		1100	120000	2093	2093
		200	44000	17	17
Chester		-	103000	650	650
		300	276000	64	64
Clinton		300	11000	168	168
		-	13000	4	4
Columbia		1000	22000	65	65
		-	9000	40	40
Cumberland		200	33000	-	-
		-	70000	2	2
Dauphin		3000	304000	-	-
		-	37000	10609	10609
Lackawanna		-	160000	453	453
		1600	24000	-	-
Lancaster		-	26000	-	-
		-	241000	15156	15156
Lebanon		-	58000	2771	2771
		1000	79000	197	197
Lehigh Northampton		300	462000	30	30
		1100	223000	-	-
Luzerne		700	75000	164	164
		-	21000	1746	1746
Lycoming		300	11000	885	885
		3300	19000	-	-
Monroe		1600	25000	134	134
		7100	147000	794	794
Montgomery		9900	293000	409	409
		-	646000	1514	1514
Montour		-	5000	1392	1392
		-	7000	-	-
Northumberland		-	83000	165	165
		700	32000	-	-
Perry		-	25000	-	-
		-	-	33	33
Philadelphia and Delaware		1000	500000	-	-
		-	223000	-	-
Pike		1600	-	7170	7170
		17100	23000	1518	1518
Schuylkill		1000	225000	292	292
		1200	91000	545	545
Snyder		-	20000	101	101
		-	64000	22	22
Sullivan		100	-	140	140
		33300	8000	590	590
Susquehanna		10200	-	767	767
		400	17000	251	251
Union		600	13000	-	-
		-	24000	72	72
Wayne		200	-	7204	7204
		4900	37000	7004	7004
Wyoming		-	-	607	607
		10800	11000	585	585
York		1500	96000	-	-
		5400	140000	569	569

* Does not include approximate total of 6,928 acres Delaware River. Acreage presently available for recreation use.

Table 4-4 Inventory of Recreation Service Area Pennsylvania Land Based Recreation

(Source: Pennsylvania Office of State Planning and Development - 1975)

County		Picnic Tables	Hunting Areas (Acres)	Campsites (vehicle and tent sites)	Trails Hiking and Nature in miles
Berks	Public	1779	15388	182	72
	Private	2574	-	1807	50
Bradford		156	47988	2	26
		751	-	706	29
Bucks		2509	-	5	91
		899	-	820	42
Carbon		1798	26499	409	44
		1241	-	961	215
Centre		2056	57722	300	209
		399	-	1814	25
Chester		1289	-	5	17
		1571	-	1359	39
Clinton		818	11758	90	397
		427	-	277	25
Columbia		226	-	0	6
		509	-	954	12
Cumberland		1392	3728	147	-
		551	-	550	46
Dauphin		602	41711	3	7
		1497	-	2319	100
Lackawanna		462	-	-	-
		2092	-	-	11
Lancaster		553	73089	2	57
		5539	-	4382	15
Lebanon		624	21724	125	77
		687	-	731	32
Lehigh Northampton		1785	9893	20	29
		3881	-	809	33
Luzerne		1702	-	200	11
		691	-	195	50
Lycoming		521	2716	101	15
		827	-	1069	345
Monroe		940	35736	140	37
		310	-	120	43
Montgomery		2780	1677	4	129
		887	-	183	41
Montour		143	242	-	32
		80	-	52	5
Northumberland		422	10066	-	15
		315	-	596	33
Perry		697	-	18	189
		498	-	661	144
Philadelphia and Delaware		1729	391	22	33
		1571	-	37	200
Pike		585	28928	551	49
		192	-	262	91
Schuylkill		651	-	285	26
		1165	-	438	7
Snyder		157	3292	5	69
		339	-	279	6
Sullivan		195	52140	71	111
		427	-	497	172
Susquehanna		51	66943	30	15
		1038	-	1043	18
Union		691	1831	62	77
		682	-	712	28
Wayne		35	-	-	712
		401	-	1274	-
Wyoming		55	288	-	831
		322	-	831	541
York		2828	6982	541	345
		605	-	347	-

Table 4-5 Inventory of Recreation Service Area New Jersey Water Based Recreation

(Sources: Beaches and Pools: U.S. Bureau of Outdoor Recreation (1972); Soil Conservation Service (1974). Freshwater Boating and Fishing: Outdoor Recreation in N.J. (1973)(ORNJ)

County		Beaches (Linear Feet)	Pools (Square Feet of Area)	Freshwater Boating (Water Acres)	Freshwater Fishing (Water Acres)
Bergen	Private	11600	195165	163	163
	Public	-	126800	158	158
Burlington		1600	29204	626	626
		-	-	418	418
Camden		6850	82700	62	62
		-	76600	422	422
Essex		200	75875	21	21
		-	168600	119	119
Gloucester		5280	32866	170	170
		-	-	539	539
Hudson		-	25250	-	-
		-	7200	15	15
Hunterdon		8610	11000	24	24
		-	-	3636	3636
Mercer		415	74780	18	18
		-	9100	334	334
Middlesex		6200	41800	58	58
		15000	740	978	978
Monmouth		8350	113940	-	-
		63400	-	686	686
Morris		900	88155	2076	2076
		5200	55200	3783	3783
Ocean		6240	-	281	281
		15800	-	1086	1086
Passaic		1212	41775	309	309
		-	50200	2242	2242
Salem		1905	53100	288	288
		-	5700	523	523
Somerset		200	168134	170	170
		-	31300	32	32
Sussex		15600	2700	3330	3330
		31700	4500	2482	2482
Union			46850	39	39
			2522	200	200
Warren		-	4000	122	122
		16840	2722	226	226

Notes:

1. New Jersey freshwater boating and fishing acreage derived from Table 2 (ORNJ): Lakes, Ponds and Reservoirs Inventory 1970. Public includes publicly and privately owned with public recreation use. Private is privately owned, private recreation use.

2. County totals do not include Delaware River acreage for which add approximately 4,480 acres to New Jersey recreation service area freshwater total for River from Port Jervis to Riverside (Burlington County).

Table 4-6 Inventory of Recreation Service Area New Jersey Land Based Recreation

(Source: U.S. Bureau of Outdoor Recreation - 1972; Soil Conservation Service - 1974)

County		Picnic Tables	Hunting Areas (acres)	Campsites (vehicle and tent sites)	Trails Hiking and Nature in miles
Bergen	Private	3330	-	45	65
	Public	75	1	1	6
Burlington		-	49135	1191	-
		55	1144	-	-
Camden		280	100	234	2
		83	-	-	-
Essex		165	300	-	-
		37	-	100	-
Gloucester		1060	871	694	-
		22	2370	-	-
Hudson		-	-	400	-
		-	-	-	1
Hunterdon		104	2883	360	28
		13	-	-	-
Mercer		260	7111	25	7
		12	-	-	-
Middlesex		29	3569	-	1
		308	-	10	-
Monmouth		251	8048	629	53
		57	-	-	-
Morris		1060	6895	235	61
		134	953	1	61
Ocean		-	-	-	-
		93	25511	1471	7
Passaic		335	100	102	57
		80	-	10	-
Salem		501	100	498	70
		-	5378	-	-
Somerset		266	30900	-	13
		130	-	-	2
Sussex		481	3225	1468	36
		38	7656	2047	28
Union		100	-	-	-
		30	-	14	12
Warren *		-	-	-	-
		155	260	54	12

* Partial additional data from map of Appalachian Trail and information from Warren County Planning Commission regarding Stevens State Park and Pequest Fish and Game.

Table 4-7 Inventory of Recreation Service Area New York State Water Based Recreation

(Source: N.Y.S. Office of Parks and Recreation - 1975)

County		Beaches (Linear Feet)	Pools Square Feet of Area	Freshwater Boating (Water Acres)[1]	Freshwater Fishing (Water Acres)[1]
Albany	Public	300	125300	5094	5094
	Private	2280	109775		
Broome		2230	57898	6055	6055
		1290	4700		
Bronx		5280	81800	469	469
		-	-		
Chenango		780	16500	3438	3438
		925	6000		
Columbia		2080	1000	8794	8794
		2650	4000		
Delaware		300	45725	15056	15056
		3040	23898		
Dutchess		2860	29100	16527	16527
		5050	21700		
Greene		550	-	7122	7122
		3460	144650		
Kings		13580	17920	494	494
		-	-		
New York		-	194500	1433	1433
		-	-		
Nassau		37670	347400	1792	1792
		17000	59000		
Orange		5300	22500	16344	16344
		1320	3900		
Otsego		1795	29600	9709	9709
		490	29800		
Putnam		850	-	9874	9874
		2730	4000		
Queens		15270	71100	719	719
		-	-		
Rensselaer		1530	20300	7700	7700
		4660	5600		
Richmond		24500	36000	486	486
		-	-		
Rockland		2230	154280	15396	15396
		1940	47950		
Saratoga		1600	36000	18748	18748
		2850	16000		
Schenectady		600	13100	800	800
		170	52396		
Schoharie		-	16580	2392	2392
		630	-		
Suffolk		76553	96748	6558	6558
		15997	76553		
Sullivan		1010	3000	19424	19424
		11240	114800		
Tioga		860	5000	3027	3027
		1360	3400		
Ulster		1550	1600	22933	22933
		8460	76875		
Westchester		2680	58200	29654	29654
		400	104600		

1. Includes 68,480 Hudson River water acres. Reach extends from Rensselaer County to New York County. Source: LUNR 1968 Survey for New York State Office of Planning and Program Coordination. Acreage listed is total water acreage in each county, not limited to recreation; capacity listed in Tables 4-14, 4-19, and 4-39 has been reduced for lake, pond and reservoir to 56.4 percent, similar to the proportion of recreation use to total water acreage derived from New Jersey (ORNJ).

Table 4-8 Inventory of Recreation Service Area New York State Land Based Recreation

(Source: N.Y.S. Office of Parks and Recreation - 1975)

County		Picnic Tables	Hunting Areas (acres)	Campsites (vehicle and tent sites)	Trails Hiking and Nature in miles
Albany	Public	2826	-	140	37
	Private	413	2485	135	82
Broome		2200	-	368	22
		220	-	895	17
Bronx		3617	-	-	99
		-	-	-	-
Chenango		437	-	472	37
		131	775	695	96
Columbia		1161	-	234	34
		21	300	677	9
Delaware		181	-	60	187
		268	116729	1944	534
Dutchess		1426	-	178	36
		747	6500	979	-
Greene		505	-	243	18
		532	2500	1793	180
Kings		400	-	-	69
		-	-	-	-
New York		244	-	-	36
		-	-	-	3
Nassau		3914	-	25	81
		-	-	-	-
Orange		1053	-	300	30
		75	350	705	138
Otsego		1605	30	298	45
		132	3822	833	50
Putnam		254	-	89	15
		16	700	-	1
Queens		1889	-	-	12
		-	-	-	-
Rensselaer		379	-	-	23
		302	5550	550	31
Richmond		413	-	-	27
		-	-	-	-
Rockland		5718	-	-	57
		461	-	-	21
Saratoga		1456	-	311	19
		515	300	1525	9
Schenectady		659	-	-	5
		203	2500	100	31
Schoharie		184	-	79	9
		226	200	1170	33
Suffolk		6841	-	1030	68
		108	50	305	152
Sullivan		459	-	532	15
		398	41316	5235	357
Tioga		224	-	-	30
		358	1098	405	66
Ulster		995	-	72	4
		575	7064	2280	110
Westchester		4851	-	361	194
		20	-	239	2

Table 4-9 Inventory of Recreation Service Area Connecticut and Delaware Water Based Recreation

(Source: U.S. Bureau of Outdoor Recreation - 1972)

County		Beaches (Linear Feet)	Pools Square Feet of Area	Boating (Water Acres)	Fishing (Water Acres)
Connecticut					
Fairfield	Public	21120	2600	7288	7288
	Private	-	-	-	-
Litchfield		26400	-	4000	4000
		-	-	-	-
New Haven		68640	710	1149	1149
		-		-	-
Delaware					
New Castle		-	36700	315	315

Table 4-10 Inventory of Recreation Service Area Connecticut and Delaware Land Based Recreation

(Source: U.S. Bureau of Outdoor Recreation - 1972)

County		Picnic Tables	Hunting Areas (acres)	Campsites (vehicle and tent sites)	Trails Hiking and Nature in miles
Connecticut					
Fairfield	Public	63	2058		4
	Private	-	-	-	-
Litchfield		136	2799	-	-
		-	-	-	-
New Haven		242	4578	598	50
		-	-	-	-
Delaware					
New Castle		639	7	73	26

Table 4-11 Inventory of Recreation Service Area Pennsylvania Proposed Public Facilities

(Source: U.S. Bureau of Outdoor Recreation - 1972)

County	Swimming Pool (s.f.x 100)	Beach Area (Lineal Feet)	Launch Ramps	Picnic Tables	Campsites (vehicle and tent sites)	Trails Hiking and Nature in miles
Berks	-	-	-	-	-	-
Bradford	-	-	-	-	-	-
Bucks	3	-	-	-	-	1
Carbon	-	-	-	-	-	-
Centre	-	-	-	60	-	-
Chester	60	-	-	-	30	10
Clinton	-	-	-	145	-	-
Columbia	-	-	-	40	-	-
Cumberland	-	-	-	106	-	-
Dauphin	100	-	3	74	-	-
Delaware	68	-	-	30	-	3
Lackawanna	25	-	-	-	-	-
Lancaster	42	-	4	25	-	-
Lebanon	-	-	4	720	-	-
Lehigh	72	-	7	30	-	5
Luzerne	90	-	-	-	-	-
Lycoming	-	-	-	10	-	-
Monroe	-	-	-	-	-	-
Montgomery	30	-	-	60	-	-
Montour	250	-	-	60	2	-
Northampton	50	-	-	-	-	52
Northumberland	-	-	7	-	-	15
Perry	-	-	-	-	-	-
Philadelphia	-	-	-	50	-	-
Pike	-	-	-	100	-	20
Schuylkill	-	-	-	20		
Snyder	-	-	-	-	-	-
Sullivan	-	-	-	-	-	-
Susquehanna	-	-	-	-	-	-
Union	-	-	-	-	-	-
Wayne	-	-	-	-	-	-
Wyoming	-	-	4	-	-	-
York				56		15

Table 4-12 Inventory of Recreation Service Area New Jersey Proposed Public Facilities

(Source: U. S. Bureau of Outdoor Recreation - 1972)

County	Swimming Pool (s.f.x 100)	Beach Area (Lineal Feet)	Launch Ramps	Picnic Tables	Campsites (vehicle and tent sites)	Trails Hiking and Nature in miles
Bergen	58	-	-	-	-	-
Burlington	-	-	-	-	24	1
Camden	-	-	-	-	-	-
Essex	-	-	-	6	-	-
Gloucester	-	-	-	10	-	-
Hudson	-	-	-	25	-	-
Hunterdon	-	-	-	-	-	-
Mercer	-	-	-	-	-	-
Middlesex	-	-	-	-	-	2
Monmouth	-	6	1	-	-	-
Morris	-	-	2	-	-	4
Ocean	-	-	-	-	-	5
Passaic	-	-	-	-	1	-
Salem	-	-	-	10	-	-
Somerset	-	-	1	20	-	-
Sussex	-	-	-	90	30	15
Union	-	-	-	-	-	-
Warren	-	-	-	-	-	12

Table 4-13 Inventory of Recreation Service Area Proposed Public Facilities For New York, Delaware and Connecticut

(Source: U.S. Bureau of Outdoor Recreation - 1972)

County	Swimming Pool (s.f.x 100)	Beach Area (Lineal Feet)	Launch Ramps	Picnic Tables	Campsites (vehicle and tent sites)	Trails Hiking and Nature in miles
New York						
Albany	-	-	-	25	-	2
Broome	-	-	-	20	-	-
Chenango	37	-	-	30	-	1
Columbia	-	-	-	10	-	1
Delaware	-	-	-	-	-	-
Dutchess	-	-	3	-	20	-
Greene	-	-	-	2	-	-
New York	-	-	-	-	-	-
Orange	-	-	-	100	75	-
Otsego	72	-	-	-	-	1
Putnam	-	-	-	-	-	-
Rennselaer	-	-	-	-	-	-
Rockland	-	-	6	55	50	10
Schoharie	-	-	-	-	-	-
Suffolk	250	-	4	30	-	5
Sullivan	-	-	-	20	-	-
Tioga	-	-	-	-	-	-
Ulster	124	1	-	-	-	-
Westchester	378	-	3	109	-	7
Delaware						
New Castle	-	-	-	-	-	10
Connecticut						
Fairfield	-	-	-	-	-	-
Litchfield	-	-	-	-	-	-
New Haven	-	-	-	-	-	-

IV.B.2.(b) Facilities Concentrations Versus Population Concentrations

The eight counties surrounding DWGNRA contain significant amounts of the total recreation supply in the 81-county recreation service area. Sussex, Warren, Monroe, Pike, Lehigh, Northampton, Orange and Sullivan counties contain 736,800 people or 2.5 percent of the recreation service area population. Table 4-14 on the following page shows the tremendous impact of recreation in these counties relative to population.

Comparing recreation facilities to population in urbanized areas presents equally startling contrasts. The Philadelphia region (Philadelphia, Bucks, Montgomery, Delaware, Chester, Burlington, Camden and Gloucester counties), with 14.8 percent of the recreation service area population contains 17.8 percent of swimming capacity, but only 3.3 percent of boating acres, 7.0 percent of campsites, 6.0 percent of trails, and 6.3 percent of hunting areas. Even more pronounced deficiencies occur in New York City facilities (Bronx, Kings, Queens, New York and Richmond counties), which has 26.1 percent of recreation service area population but only 5.6 percent of swimming capacity, 1.3 percent of boating, no campsites, 2.5 percent of trails and 5.3 percent of picnic tables.

Somewhat smaller recreation facilities deficiencies characterize all other urbanized regions within the recreation service area. It is likely the same pattern exists in the Harrisburg, Albany, Allentown, Scranton-Wilkes Barre, Trenton, Wilmington and Jersey City regions.

Table 4-14 Seven-County Impact Area Totals as Percent of Recreation Service Area

	Beaches (Linear Ft.)	Pools, Water Area (Square Feet)	Boating (Water Acres)	Picnic Tables	Hunting (Acres)	Campsites	Trails (Miles)
Seven-County Impact Area Total	111,810	1,038,122	42,989	10,227	127,104	12,203	886
Recreation Service Area Total	776,262	10,454,236	283,521	123,310	878,693	64,882	9,847
Seven-County Share of Recreation Service Area	14.6%	9.9%	15.2%	8.3%	14.5%	18.8%	9.0%

Note: As Lehigh and Northampton counties provide supply information on a joint basis, for the purposes of this table, the "Seven-County Impact Area" includes Lehigh County.

TILP, if built, will increase and accentuate the above imbalances by producing significant facility increases away from population centers in an area of already abundant recreation opportunity. On a regional basis, TILP would represent one of several means (these are discussed in Chapter XIII) to increase the overall supply of recreation facilities in the service area.

IV.B.2.(c) Supply Characteristics in the Tocks Island Lake Impact Area

Aside from the statistical tabulation of inventory data for the entire recreation service area by county, a more qualitative analysis of recreation facilities within the immediate area of the proposed DWGNRA was undertaken through field observation and interviews. The most noteworthy impression is the difference between the current activities on the Pennsylvania and the New Jersey sides of the river.

The Pennsylvania counties in the immediate impact area of Tocks Island are characterized by private resorts, camps and attractions. These varied facilities run the full range of providing luxury accommodations on a par with those in the city to primitive camping sites. The five Pennsylvania state parks which are in this three-county area account for 1,300,000 annual visits of recreationists to the area; however, these parks are not the primary attraction and they function as only one segment of a larger market. The private facilities are dominant in this respect. These private facilities are well organized and represented by a special tourist-oriented Chamber of Commerce, the Pocono Vacation Bureau. This Bureau represents approximately 90 to 95 percent of the businesses in the area, and its main function is to coordinate regional advertisement and promotion for these businesses. To gain an understanding of the workings of this private market segment, various on-site interviews were conducted at approximately 11 percent of the resorts and other accommodation facilities, three percent of the various attractions, 13 percent of the campgrounds, and 18 percent of the restaurants in the area. The percent of the businesses interviewed

could have been much higher if the survey had been conducted during the summer months; but as it were, many of the facilities were closed for the season.

Generally speaking, these private facilities serve three distinct, but broad, markets: the family on vacation, the business or group at convention, and the honeymooners. Fortunately the peak times for these three markets occur at different times of the year and provide some business nearly year-round. The vacation peak occurs during July and August, the conventions usually take place in the fall and early spring, and the honeymooners arrive mostly during May and June. The only excessively slow period for a majority of facilities is the mid-winter months of January and February. Depending on the type and size of facilities some can and do successfully operate year-round by serving all three of these markets. Others by their very nature are seasonal, such as ski areas, campgrounds, hunting preserves and the like. Most restaurants and major resorts are able to remain open 80 to 90 percent of the year and close only to allow the owner a vacation during the relatively slow periods.

The geographic market served depends largely on the type of facility and two distinct trends have emerged. First, the plush luxury resorts draw heavily on the surrounding metropolitan areas, primarily New York City and Philadelphia, and to a lesser extent Baltimore, Washington, D.C. and Pittsburgh metropolitan areas. Some resorts indicate the New York City urban area (which in this case includes New York City and the highly

urbanized portions of New Jersey, New York and Connecticut surrounding it) would contribute 50 to 80 percent of their peak period business. The other noticeable trend was that the other facilities, such as restaurants, campgrounds and camps, motels and smaller resorts relied much less on the larger metropolitan areas for their business. For this latter group of facilities the percent of patronage from the urbanized New York area would account for only 10 to 20 percent of their activity days. The bulk of their patronage comes from the states of New York, New Jersey and Pennsylvania but primarily from the nonurbanized areas of those states.

Another observable trait of the vacation segment of the market was a marked decline in the average length of stay. In the mid-1960's and earlier, the average stay was a full two weeks, and now the average length of stay is four days to a week at maximum. This trend is a result of an increased desire to see more and varied areas while on vacation, and satisfaction of this desire has been possible by a greater mobility. However, very recently this trend has ceased and may even be reversing itself as a result of the energy crisis that occurred in the past year and a half. The general impact of the gasoline shortage was twofold; first, there was a noticeable decrease in the number of visitors to the area for recreation purposes and second, there was a decrease in the mobility of those who did come.

Growth in the capacity of the private facilities in this area has been substantial but sporadic. Within the Pocono Mountain Region, which includes Carbon, Pike, Monroe and Wayne counties, growth in the total number of

accommodations (motels, resorts, cottages, etc.) was approximately 50 percent over the past 15 years. This is an average rate of growth of about 300 rooms per year, resulting in a total accomodation estimate of 14,000 rooms for the Pocono Mountain Region. Stroudsburg is the only major population center in this Pocono Mountain region estimate. The pattern of growth was not constant and was mainly a response to exogenous factors such as completion of Interstate 80 and even the anticipation of Tocks Island dam.

The outlook for future facility expansion is somewhat blurred at this point. The primary cause of the uncertainty is the energy situation, and the past crisis has caused some worry about the area's ability to continue to grow. Concerns of this nature were voiced by about one-third of those interviewed. A somewhat larger percentage of those contacted felt the area would continue to be attractive to vacationers, conventioners and honeymooners such as it had in the past. There was little indication that expansion plans were being held in limbo because of uncertainty of the Tocks Island dam. In fact, at least one business was expanding in the face of the fact that it would be inundated if the Tocks Island project were to be completed.

The character of the New Jersey area in the immediate vicinity of the proposed dam is the antithesis of Pennsylvania just across the Delaware River. There are few full-service resorts and no highly organized vacation bureaus promoting tourism; in their place are several state parks and forests, private second home developments surrounding private lakes,

environmental education centers and only a few resorts and ski areas. The setting is much more rural and much less commercial.

Public recreation facilities certainly play a larger role in contributing to total annual visitations in this area, and also indicate the type of activities that predominate. Camping, fishing, hiking, and picknicking are the dominant activities and they are dispersed over various state parks and forests. This type of activity is in contrast to the mass participation in organized activities at large resort areas which is so prevalent in Pennsylvania.

In Sussex County there are several environmental education centers which provide educational experiences to children with such activities as living farms, wildlife refuges, and historical site studies. The programs are operated through local school systems and serve a wide-ranging market by accepting school children from all over New Jersey.

In addition to these modified education centers, there are numerous group camps whose organization is centered on similar nature-oriented activities. Some of these camps and organizations are also engaged in various research projects primarily on nature topics. There is also a scattering of scout and YMCA camps throughout the region.

The drawing power of the region is much less than that of its sister area in Pennsylvania, which is primarily due to the lack of promotion for the

New Jersey activities. The primary source of recreationists for this area is the entire State of New Jersey and the New York City urbanized area. New York City residents account for a high percentage of the utilization of the New Jersey state parks in the area and also contribute heavily to the few resorts and ski areas that are in Warren and Sussex counties. In general, however, this region relies more heavily on a local population for its recreation activities than Pennsylvania.

The table below shows the state parks and their utilization in the immediate area of DWGNRA.

Table 4-15 State Park Facilities and Attendance in the Seven-County Impact Area

	Annual Visitor Days	Acres Land	Acres Water	Acres Total
New Jersey				
High Point	387,666	12,292	80	12,372
Stokes	205,082	14,177	55	14,232
Swartswood	107,702	651	602	1,253
Worthington	74,987	5,769	55	5,824
Stephens	121,367	133	0	133
Jenny Jump	41,757	934	33	967
Total	938,561	33,956	825	34,781
Pennsylvania				
Big Pocono	262,514	1,306	0	1,306
G.W. Childs	76,690	154	0	154
Promised Land	602,450	1,747	595	2,342
Gouldsboro	183,230	2,545	255	2,800
Tobyhanna	188,975	4,018	170	4,188
Total	1,313,859	9,770	1,020	10,790
New York				
Lake Superior 1/	15,000	1,197	212	1,409
Highland Lakes 1/	7,500	2,869	32	2,901
Storm King 1/	17,500	1,415	0	1,415
Bear Mountain 2/	2,160,000	5,033	33	5,066
Harriman 2/	1,933,000	44,306	1,875	46,181
Goosepond Mountain 1/	15,000	1,541	2	1,543
Total	4,148,000	56,361	2,154	58,515

Notes: New Jersey data includes State Forest; years may vary but are most recent available.

The table indicates all visitors and acreage even though a portion lies outside Seven County Impact Area.

1/ Undeveloped park, visitor usage is estimate from New York State Park officials.

2/ Bear Mountain and Harriman State Parks are included in their entirety even though some portions located in Rockland County are outside the Seven County Impact Area.

Source: Appropriate State Departments.

IV.B.2.(d) Dam Based Recreation

Dam based impoundments within the recreation service area are particularly important facilities as their facility mix and utilization patterns are most comparable to TILP. Dams within the recreation service area are constructed by three groups: The U.S. Army Corps of Engineers (U.S. Army Engineer Districts in Baltimore and Philadelphia); the Soil Conservation Service (Upper Darby, Pennsylvania); and electric utility companies under auspices of the Federal Power Commission (New York, New York). For recreation purposes, the Soil Conservation Service constructs dams with impoundments under 25,000 acre feet with the Corps constructing larger ones. Recreation is considered a by-product of hydroelectric power project impoundments.

Five major Corps dams exist within the recreation service area with a combined 1971 annual attendance of 776,000 of which 19.1 percent, or 148,650 are swimming visitations. These facilities are located at East Sydney Lake, New York; Whitney Point Lake, New York; Beltzville Lake, Pennsylvania; Francies E. Walter Dam, Pennsylvania; and Prompton Lake, Pennsylvania. There are four additional facilities under construction that will open within a decade. Cowanesque will be completed in mid-1980 with an expected annual visitation of 119,000 of which 30 percent will be swimmers. Tioga and Hammond will open about 1982 with a combined annual visitation of about 447,000, and they are also expecting 30 percent swimmers, ten percent boaters and 15 percent campers. In addition, Blue Marsh is under construction now and should open in late 1979 with some 435,000 visitors expected during its first full year of operation.

Nine Soil Conservation Service dams, with recreation facilities, are programmed for completion by 1980 within the recreation service area. If it is assumed that water based recreation benefits accrue proportionally to impoundment size then the total impact of these facilities should be less than that produced by the Corps of Engineers. No precise figures are available as to facility mix. These dams include the following:

New York	
Batavia Kill	Greene County
New Jersey	
Furnace Brook	Warren County
Stony Brook	Hunterdon/Mercer Counties
Assunpick Creek	Mercer/Monmouth Counties
Pennsylvania	
Brandywine Creek	Chester County; New Castle, Del.
Koercher Creek	Berks County
Mauch Chuck Creek	Carbon/Schuylkill Counties
Briar Creek	Columbia County
Nescopeck Creek	Luzerne County

There are several hydroelectric reservoirs located within the recreation service area including Holtwood, in Lancaster County, Pennsylvania; Lake Wallenpaupack in Pike and Wayne counties, Pennsylvania operated by the Pennsylvania Power and Light Company; York Haven and Safe Harbor. In addition, there is the Yards Creek pumped-storage facility on Kittatiny Mountain in Warren County, New Jersey, operated by the Public Service Electric and Gas Company and the Jersey Central Power and Light Company.

Four additional small hydroelectric dams are located at the northern edge of the recreation service area in New York. These Niagara-Mohawk Power Corporation dams include the Mechanicsville, Johnsonville and Schaghticoke

reservoirs with a combined water area of 651 acres. A fourth hydroelectric facility at Schoharie Creek, Schoharie County, New York has a 430-acre impoundment with a present annual visitation of 20,000.

A discussion of existing facilities and programmed visitation increases is contained in Chapter IV.B.4.(c).

IV.B.2.(e) Ocean Beach Capacities

A factor which will have a tremendous effect upon swimming demand within the recreation service area is the extensive public and private beach areas along the New Jersey and New York coastline. These beaches lie within an easy 1.5-hour drive of New York City and Philadelphia, and are capable of absorbing enormous amounts of swimming and boating demand.

The New Jersey Statewide Comprehensive Outdoor Recreation Plan of 1973 lists 152,020 linear feet of public and private ocean shoreline used for recreation within the recreation service area. An additional 376,234 linear feet of shore on the south shore in Cape May and Atlantic counties is located within 150 miles of DWGNRA. The Long Island shore line, all of which is within the recreation service area, contains 13,580 linear feet of beach in Kings County, 15,270 linear feet in Queens County, 54,670 linear feet in Nassau County, and 92,550 linear feet in Suffolk County.

Assuming the space standards used for determining recreation capacities within the recreation service area apply to ocean beaches, the ocean beaches within the service area are capable of handling 985,000 people on a given day.

The additional 376,234 feet of beach on the New Jersey South Shore accommodates an additional 1,128,702 people. Forty-seven percent of the shoreline capacity of 2,133,700 falls within the recreation service area, and represents 20 percent of total capacity of all swimming facilities within the area. The total ocean front swimming capacity, including the South New Jersey shore, is slightly more than half of the swimming capacity of the entire service area.

IV.B.2.(f) Private Residential Swimming Pools

One factor affecting the overall swimming capacity, and the resultant demand, in the service area which does not appear in the capacity tables is the private residential pool. Although these facilities are relatively small, their number is not. "Swimming Pool Weekly" estimates 1,021,500 private residential pools are presently in use in the nation, representing 75 percent of the total inventory of artificial pools in the country. Furthermore, they indicate new construction in the Northeast part of the country is above the national average. It is, therefore, reasonable to assume that on a population basis there is a proportionate number of private pools within the service area.

With over 29,000,000 people, or approximately 14 percent of the national total, it is estimated that 143,000 private pools are within the service area. To compute the capacity of these pools, it is assumed that on a peak Sunday approximately 90 percent of the families will use their pools. The capacity would then equal 393,822 people (.90 x 3.06 people/family x 143,000). Adding this to the capacity of public beaches and pools

(4,912,348), the total swimming capacity becomes 5,306,170. The private pools contribute approximately 7.5 percent to this total.

IV.B.2(g) Great Adventure Park and Jungle Habitat

Great Adventure Park comprises 1,600 acres in Jackson (Ocean County), New Jersey. This private drive-through animal preserve experienced 1.4 million visitations during 1974. Approximately three million visitors are predicted during 1975. This facility is extremely noteworthy because of its uniqueness and its absorption of day trip and overnight visitors. During 1974, campgrounds within a ten-mile radius experienced 100 percent bookings. It is likely Great Adventure attendance will drop to approximately two million annual visitors by 1980.

Closer to DWGNRA is Jungle Habitat in West Milford, New Jersey in Passaic County. A few years older than Great Adventure Park, and somewhat smaller in scope. This park appeals to the same market with its wild animal preserve and amusement activities.

IV.B.3 RECREATION SPACE STANDARDS AND DESIGN CAPACITIES

IV.B.3(a) Analysis

In determining the carrying capacity of the recreation inventory within the service area, the key is the recreation space standard. Typically, the

number of acres or units of available recreation facilities are multiplied by the number of persons per day that can reasonably be expected to use that facility, and the result is the number of recreation opportunities available.

Admittedly, certain problems arise by using this method. For one thing, without detailed information about the quality of recreational experience available at each existing facility, a common standard may not realistically reflect the actual usage. Secondly, common standards can not be indiscriminately applied to facilities which serve different segments of the population. The intensity of facility use that is common to the typical urbanite may be totally unacceptable to the rural inhabitant. Furthermore, few government planning agencies or private interest groups will agree on a common standard, even those groups which operate within the service area.

Without this detailed information on the existing facilities, however, the choice of method for determining capacity is limited. The objective, therefore, is the selection of a set of standards which is believed to provide a quality of experience acceptable to the "average" resident within the service area and which will not exceed the physical carrying capacity of the facility. To begin, a brief review of space standards presently used or recommended for new facilities is herein presented.

The standards listed in Table 4-16 below are for the most part a compilation of "Outdoor Recreation Space Standards" by the Department of the

Interior, Bureau of Outdoor Recreation, reprinted in March 1970. Additional standards proposed for comprehensive outdoor recreation plans by the New Jersey Department of Environmental Protection and New York State Parks and Recreation have been included since both of these agencies operate within the recreation service area.

These standards are fairly representative of those in use by several federal and local agencies and serve to illustrate the tremendous range that exists. In some instances, the standards include requirements for secondary facilities such as parking, sanitary stations, boat ramps, etc., as well as adjacent open space. Generally, standards which include greater detail also recommend a lower degree of land utilization and a correspondingly higher quality of development. One source of each standard is noted in the bibliography mainly to illustrate the agency's area of the country where each standard is used.

Table 4-17 summarizes the range of standards for each activity. Since not all standards went into great detail, a degree of inaccuracy may have resulted in converting each standard into a common unit, that is; if the standard proposed, say 25 picnic tables per acre, has neglected parking space and sanitary facilities, the actual land utilization may be significantly lower. Since few of the standards calculated user-days per acre many of the figures in the last column have been calculated based on an assumed range of turnover rates and, where applicable, the number of people per unit; for example, the number of people per boat may vary from 2 to 4, the number per campsite from 4 to 5, and the number per picnic table from 4 to 8.

Table 4-16 Comparison of Recreation Standards

SWIMMING

Facility	Standard
shoreline - ocean, lake, reservoir, or stream (1)	25 effective feet of shoreline accommodates 150 persons per day, and 50 persons at one time. (turnover equals 3). An effective foot consists of: one lineal foot of shore with 100 foot-wide band of water suitable for swimming; 200 foot-wide strip of beach for sunbathing; 100 foot-wide buffer zone for utilities and picnicking.
beach (2)	100 to 200 sq.ft. of swimmable water per swimmer. 50 to 100 sq.ft. of beach per swimmer.
beach (4)	75 sq.ft. of beach per person. Turnover factor is 1.5.
beach (5)	100 sq.ft. per person. (435/acre). Two persons per foot of shore.
pool (8)	30 sq. ft. of water for each swimmer in the water. 2 to 1 proportion of deck area to water area.
beaches (8)	150 sq. ft. of water for each swimmer in the water. 300 sq. ft. of land for each swimmer not in the water.

BOATING, CANOEING, AND WATER SKIING

Facility	Standard
trailered boats (1)	1 launch facility per 160 surface acres of boating water.
non-trailered boats (2)	Mooring or slippage space for 100 boats at one time. 1.6 water acres per boat.
boating and water skiing (7)	1 water acre per boat, 4 people per boat.
anchored fishing boats (2)	4 to 7 boats per water acre.
trolling fishery boats (2)	2 to 4 boats per water acre.
power and sail boats (2)	3 water acres per boat.*
water skiing (2)	5 water acres per boat.* * (these figures exclude the 300-foot strip around the shores zoned against these uses except at access points)
water skiing (9)	One person per 13.3 acres of water. 3 persons per boat, 20 acres per boat may be adequate, but 40 acres per boat is more desirable.
boating (9)	One person per 8 acres of water surface. Estimating 2.5 persons per boat, or 20 acres per boat. Small lakes with restricted motor sizes could support more than one boat per 20 acres.
canoeing (9)	One person per 1/4 mile of stream. Estimating 2 persons per canoe or 1/2 mile of stream per canoe. Larger streams probably could handle one canoe per 1/4 mile of stream or more.
motor boat area (10)	20 acres of water per power boat. 2.5 persons per boat, an optimum day with 40 launchings would produce 100 user days per ramp or 100 user days per acre of land and .385 user days per acre of water. <u>This amounts to .01 acre of land and 2.6 acres of water per user day</u>.
canoe area (10)	Estimating 2 persons per canoe per 1/2 mile of stream. Larger streams, one canoe per 1/4 mile of stream.

Table 4-16 Comparison of Recreation Standards (Continued)

Facility	Standard
water skiing area (10)	One ski boat requires 40 acres of water, therefore, 13 ski boats would require 520 acres of water to support one ski boat ramp. With an average of three persons per ski boat, a ramp would produce 120 activity days during an optimum day use, or 120 user days per acre of land and .23 user days per acre of water. This amounts to .0083 acres of land and 4.33 acres of water per user day.
power or sail (5)	1 boat/3 water acres. 3 people/boat. (1 acre/person).
water skiing (5)	1 boat/5 water acres.
canoes (5)	1/mile of stream.
access unit (5)	40 boats/unit.

FISHING

Facility	Standard
boat fishing (7)	2.5 persons per boat and boat trailer. 1 acre of water surface for every 50 fisherman. 1 lb. of fish per fisherman day. Fish production should be 50 lbs. an acre each year.
fishing (11)	Nationwide average in 1958 of fish caught was 2.2 lbs. per day.
fishing in anchored boats (12)	4 to 7 boats per acre.
fishing in trolling boats (12)	2 to 4 boats per acre.
fishing area (9)	One person per 3.6 acres of surface water. 2.2 persons per boat. 8 acres per boat.
stream fishing (9)	One fisherman per mile of stream.
river fishing (9)	One fisherman per 1/4 mile. Approximately 3 acres per fisherman.
boat fishing (10)	A fishing boat requires 8 acres of water. 13 fishing boats require 104 acres of water to support one boat ramp. An average of 2.2 persons per boat would produce 88 optimum user days per 40 fishing boats during one day, or 88 persons per acre of land and .846 user days per acre of water. This would be .0114 acres of land and 1.182 acres of water per user day.
lake fishing (5)	15 persons/acre of water. 20 feet of shore/person.

HIKING, NATURE STUDY, AND HORSEBACK RIDING

Facility	Standard
hiking trail (6)	Minimum of 10 acres provide a 3 mile trail, and a 1-1/2 mile trail.
trail, hiking and nature hiking (11)	Minimum of one mile of trail on public lands for each 20 persons.
hiking trail (13)	One mile of trail for every 4 persons.
nature trail (9)	50 people per mile of trail. Trails are 1 to 2 miles long. With a turnover rate of 8, there are 400 people per mile of trail per day.
hiking trail (10)	A hiking trail should be 10 feet wide over a distance of 20 miles. It requires 24 acres of land. Potable water available at six mile intervals. 20 hikers per mile of trail. Turnover rate of 5. 100 hiker user days/mile. This amounts to .34 acres per user day, or 2.96 user days per acre.

Table 4-16 Comparison of Recreation Standards (Continued)

Facility	Standard
nature trail (10)	A nature trail is estimated as 10 feet wide and two miles in length. The trail occupies an area of 2.4 acres. 10 persons per mile of trail. A nature trail is estimated to be in field use about four hours during the day. .072 acres are needed per user day.
wilderness hiking (5)	4 persons/mile of trail.
hiking (5)	16 persons/mile of trail.
horseback (5)	12 persons/mile of trail.

PICNICKING

Facility	Standard
picnic area (2)	8 to 10 picnic tables per acre for a family unit. 16 picnic tables per acre for organized groups. 5 people per table. Turnover of 2.
family picnic area within communities (1)	16 units per acre. A unit consists of table and available cooking facilities. 600 activity days annually per unit. 1 off-street car space a unit.
family picnic area outside communities (1)	8 units per acre, located outside communities. 400 activity days annually per unit.
group area (1)	25 units per acre. 600 activity days annually per unit.
picnic area (6)	12 tables per acre and 350 sq.ft. of parking.
picnic area (15)	10 to 15 picnic sites an acre. Each table accommodates 6 to 8 people.

Facility	Standard
picnic area (16)	4 to 8 tables per acre. Each table accommodates 6 to 8 persons.
picnic area (17)	An average of 10.5 tables per acre. Saturation rate is an overall maximum average of 220.1 picnickers a day per acre of land.
rural picnic area (9)	One developed acre for each 40 picnickers at 8 tables per acre with 19 undeveloped acres (allowing less than 1/2 acre parking for 10 cars). A turnover rate of 1.6 persons per table and, with over 3 people per table, 40 persons per acre each day is expected.
urban picnic area (9)	One developed acre per 90 picnickers at 16 tables per acre, plus 9 undeveloped supporting acres.
Picnic area (5)	5 people/table. 8 tables/acre. (40 peole/acre). 2 to 3 tables/acre of total area.
Picnic area (18)	10 to 20 sites per acre

CAMPING

Facility	Standard
camp sites (2)	3000 sq.ft. per unit. A unit includes tent space, vehicle parking space, and use area for cooking, eating, wood storage, trash disposal, etc. 14 units an acre or 56 people an acre. Privacy size is 4000 to 8000 sq.ft. a unit; 5 to 11 units an acre or 20 to 44 people an acre.
camp sites (11)	An average of 15 people or about 3 sites an acre.
family, tent or trailer (1)	4 units an acre. (300 activity days annually per unit.)

Table 4-16 Comparison of Recreation Standards (Continued)

Facility	Standard
group (1)	5 acres for 50 persons for short periods of time. (350 activity days annually per acre.)
tent and trailer camps (6)	50 acres for 400 people.
camping area (16)	3 to 4 designated camp spaces an acre.
family camping facility (3)	(4 to 16 sites per acre.)
camp site (17)	For privacy, a site should have a minimum of 2500 sq. ft. or a lot 50 ft. x 50 ft. (16 sites per acre.)
overnight (5)	4 persons/site. 4 sites/acre. (16 people/acre.) 1 person/acre of total area including open space.
overnight (18)	6 sites/acre optimum with 25 sites grouped on a loop road. Toilet facilities/5 sites.

HUNTING

Facility	Standard
pheasant and small cooperatives (11)	10 acres per hunter.
duck hunting (11)	1 blind for each 9 acres of marsh habitat.
deer hunting (11)	1/10 sq.mile per hunter.
small game hunting (11)	8 acres of range per hunter.
hunting enterprise (12)	A farm large enough to encompass controlled shooting activity should be 300 to 500 acres, with 50 acres for every 4 hunters.
hunting area (5)	1 person/5 acres.

IV.B.3.(b) Summary

The selection of a set of standards for determining existing carrying capacities was made by rejecting both the highest and lowest standards (See Table 4-17) for each activity and settling on a median value of the ones remaining (See Table 4-18). It was felt that the lowest standards in each group would provide at best a poor quality of recreation experience. Conversely, while the highest standards may reflect an ideal quality of experience, it was felt that they do not reflect the level of land utilization appropriate to the Northeast section of the country and would, if used in the context of this chapter, suggest a carrying capacity way below that which is reasonable to expect.

Table 4-17 Summary of Recreation Space Standards

Facility	Space Standard	Turnover	Land Utilization (Users/day/acre)
Swimming:			
Beach	50 to 300 s.f./person	3 to 1½	2610 to 220
Water	25 to 200		5220 to 334
Total (w/ parking, buffer, etc.)	160 to 450		815 to 145
Boating:			
General	1 to 6.5 acres/boat	3 - 1	4.0 to 0.4
Fishing	¼ to 2.5		15 to 0.8
Water Skiing	3 to 40		1.0 to 0.22
Fishing:			
Lake	0.07 to 1.2 acres/person	1	15 to 0.8
Stream	¼ to ½ mile of stream		
Trail:			
Nature	1/50 to 1/5 mile/person	8 to 3	150 to 33
Hiking	1/40 to 1/4		10 to 3
Horse	1/12		- to 2
Picnicking	1/25 to 1/4 acre/site	1½ to 1	220 to 16
Camping:			
Site	1/16 to 1/3 acre/site	1	64 to 12
(w/ open space)	4 acres/site		4
Hunting:	5 to 64 acres/person	1	0.20 to 0.015

Table 4-18 Space Standards used to Determine Carrying Capacity of Existing Recreation Facilities,

Facility	Standard	Turnover
Swimming:		
Beach	100 sq. ft. of Beach/Person	1.5
Pool	36 sq. ft. of Pool/Person (1/3 of people in water at one time)	3
Boating (all types)	3 water acres/boat 3 people/boat	2
Fishing:		
Lake	1/3 water acre/person	1
Stream	1/2 mile of stream/person	
Trail (all types)	1/12 mile/person	5
Picnicking:	4 sites/acre 5 people/table	1.5
Camping:	6 sites/acre 4 people/site	1
Hunting:	10 acres/person	1

IV.B.3.(c) Recreation Service Area Facility Capacities

The capacity of the recreation inventory of the recreation service area is determined from the space standards previously described as follows.

Swimming Beaches:

Linear feet of beach X two swimmers per linear foot X a turnover of 1.5 or linear feet of beach X 3.

Swimming Pools:

Square feet of pool area X one swimmer per 36 square feet X a turnover of 3 X three persons per swimmer in the water, or square feet of pool area X 9/36 or 1/4.

Boating:

Acres of water X 1 boat per 3 water acres X 3 people per boat, a turnover of 2 or water acres X 2.

Fishing:

Acres of water X one boat/acre X 3 people/boat, or acres of water X 3.

Picnicking:

Number of tables X 5 people per table X a turnover of 1.5, or number of tables X 7.5.

Hunting:

Number of acres X 1 hunter per 10 acres, or number of acres divided by 10.

Camping:

Number of campsites X 4 people per site.

Trails:

Miles of trails X 12 people per mile of trail X a turnover of 5, or number of miles of trail X 60.

From these standards and the facility inventory tables by state and county, the capacity of the recreation service area within each state is calculated by activity type in the following table. Recreation service area totals by activity are also given.

Table 4-19 Daily Recreation Capacity of Recreation Service Area by State (In Person)

Facility	New York	New Jersey	Pennsylvania	Connecticut	Delaware	Total
Swimming						
Beach	866,700	669,306	414,300	348,480	-	2,298,786
Pool	597,689	407,120	1,598,750	828	9,175	2,613,562
Total	1,464,389	1,076,426	2,013,050	349,308	9,175	4,912,348
Boating	321,332	60,232	159,974	24,874	630	567,042
Fishing	481,998	90,348	239,961	37,311	945	850,563
Picnicking	372,090	70,643	473,993	3,308	4,793	924,827
Hunting	19,227	15,625	52,073	944	1	87,870
Camping	101,028	38,196	117,620	2,392	292	259,528
Trails	187,860	30,600	367,560	3,240	1,560	590,820

Source: Taken from Tables 4-3 through 4-10, and capacity standards of IV.B.3.(c).

IV.B.3(d) Qualitative Recreation Standards

A complete discussion of standards for recreation should include a brief introduction to what may be considered as qualitative standards. This discussion can be regarded as an investigation into a relatively unexplained dimension of the question of recreation supply, an aspect of that question that deals more with the satisfaction derived by the user of a recreation facility, rather than with the actual physical circumstances of the use. The question of user satisfaction is, of course, very sensitive to definitions of the nature of experience from which the satisfaction is to be derived; is it to be leisure, play, fun, sport, relaxation, recreation? Each of these terms has a different meaning in a literal sense, and almost an infinite variety of connotations when considered as sources of satisfaction for an individual. It is far beyond the scope of this work to attempt any complete description, let alone analysis of what the "recreation" experience might be to any one person. Rather a broad overview of the recreation experience is sketched and some implications about the qualities of this experience as they might be appreciated by a variety of persons is discussed. The question of "Psychological Carrying Capacity" treated earlier will be examined as a limiting factor to the individual's ability to achieve satisfaction from the recreation experience.

The importance of establishing concepts of qualitative standards for recreation cannot be underestimated as it is most likely that the satisfaction derived by the individual is the best measure of recreation's contribution to the welfare of society. Recreation's contribution to society as an organizing and socializing force has long been appreciated in the context

of sports and play. Psychoanalytic theory has recognized the functions of play in the child and fantasy in the adult as similar processes allowing the individual to assimilate excessive experiences and make of himself "master of the situation".[1] Thus, recreation of various sorts can range in function from helping to socialize the individual, a commonly accepted value of team sports, to allowing the individual to cope with potential psychological problems. Some of these functions of recreation are well documented in the literature of psychology and sociology.

Other functions of recreation, more subtle, yet no less important have yet to be treated by science or social science. Chief among these other benefits to be derived from recreation is the individual's profit from close association with the natural environment, the interaction with nature central to many forms of outdoor recreation. To examine these benefits we may look to poetry and literature where the appreciation of the natural environment has ever been a primary subject. Three examples are chosen which illustrate the quality of recreation experience as perceived by highly different users. William Wordsworth, in his "Lines Composed a Few Miles Above Tintern Abbey" (1798) elegantly describes the great satisfaction he gained from this association with nature:

> ....Therefore am I still
> A lover of the meadows and the woods,
> And mountains; and of all that we behold
> From this green earth; of all the mightly world
> Of eye, and ear - both what they half-create,
> And what perceive; well pleased to recognize
> In nature and the language of sense,
> The anchor of my purest thoughts, the nurse,
> The guide, the guardian of my heart, and soul
> Of all my moral being.
> (lines 102-111)

(Note: Footnotes are found on Page IV-153)

Wordsworth wrote these lines "...after a ramble of four or five days," and while the view of nature as "nurse, guide and guardian" is characteristic of the Romantic Age in general, other more modern writers have been likewise inspired while hiking. In this next passage, taken from the Hemingway short story, "The Last Good Country" the characters, Nick Adams and his sister, experience a sense of religious awe while walking in the woods.

> "...There was no underbrush and the trunks of the trees rose sixty feet high before there were any branches. It was cool in the shade of the trees and high up in them Nick could hear the breeze that was rising. No sun came through as they walked and Nick knew there would be no sun through the high top branches until nearly noon. His sister put her hand in his and walked close to him.
>
> "I'm not scared, Nickie. But it makes me feel very strange."
>
> "Me, too," Nick said. "Always."
>
> ..."Nickie, where we're going to live isn't as solemn as this, is it?"
>
> "No. Don't you worry. There it's cheerful. You just enjoy this, Littless. This is good for you. This is the way forests were in the olden days. This is about the last good country there is left. Nobody gets in here ever."
>
> ..."...this kind of woods makes me feel awfully religious."
>
> "That's why they build cathedrals to be like this."

While these aesthetic and religious experiences of nature might seem to be specific to the artistic temperament, such is not the case. A 1956 study "... asked 36 informants in personal interviews to tell (us) in their own words why they were in the wilderness. Analysis disclosed five broad categories of reasons which, taken together, depict the imagery of the wilderness by those who visit it."[2] It is important to note that these images were used by "ordinary" campers, presumably without poetic intentions.

> Single images were rarely maintained by the respondents, although four saw the wilderness only as a locale for sport and play, four only as a fascination, and one each exclusively a sanctuary or heritage. Usually the view of the wilderness in terms of sport and play was combined with its fascination, its value as a refuge, or a heritage. It was also common to find the images of the wilderness as a fascination and a sanctuary combined. [3]

Simply knowing that campers find these spiritual qualities, however, vaguely defined, in their experience of nature is a first step toward defining some concepts of qualitative recreation standards, at least as regards the satisfactions to be gained from the "wilderness" experience. The preparations that these parties made also offer some insight into the qualitative experiences they sought.

Of this sample of campers regarding the planning efforts of each for their wilderness experience, "...fourteen spent one or two months; 14, more than two months but less than a year; and seven spent a year or more." [4] Of the, "...20 groups represented by these interviews (only one) was without an experienced outdoorsman in the main party, and that group had employed a professional guide." [5] It is obvious that with such extensive planning efforts that the campers were preparing themselves for a very particular qualitative experience. Through the months of planning, the campers' anticipation and expectations caused them to form an idealized conception of what the quality of their recreation experience would be. The language they used to describe the imagery of their experience, "fascination, refuge, sanctuary", reveals their idealized expectations were rewarded by the quality of their experiences.

Anticipation and expectation can shape the quality of the recreation experience. To use an extreme example, the demolition derby can be seen to be both a sport and spectator recreation that takes its form entirely from the expectations of its audience. Why put up with the monotony between crashes when you can create a sport that is entirely composed of crashes?

The concept of "Psychological Carrying Capacity" as it is in fact determined by the expectations of the individual becomes important to this discussion once again. There is nothing inherent in the nature of the activity, nor the site upon which it is carried out (given certain minimal standards) that can explain the individual's satisfaction or lack of same with his recreation. Rather, the individual's expectations must be considered as the prime determinant of his satisfaction with the recreation experience. For Hemingway's Nick Adams the fact that, "Nobody gets in here ever", made of that place, "The Last Good Country". Nick's expectations for that place would have been destroyed even by the thought that anyone else ever went there. For Nick, the psychological carrying capacity for that site for other people was zero. Likewise the expectations of the stock car racing fans for crashes were not often enough rewarded, and the demolition derby was created. For the spectator of the demolition derby the constant crashes and the contagious enthusiasm of the crowd meets his expectations and provides a satisfying recreation experience.

It has been pointed out that the individual's satisfaction with the recreation experience is largely determined by his expectations. The

implications of this for defining qualitative standards for recreation are that the expectations of the user must be identified so that the "carrying capacity" of his expectations for other, perhaps, conflicting elements can be determined. Short of a rigorous identification of user expectations it is possible to conclude that the recreation experience is highly sensitive to considerations of quality.

Unfortunately it is impossible to do little more than set physical and ecological carrying capacity standards in a planning effort such as this. These quantitative standards, while important parameters for maintaining the natural setting, say little about the quality of the experience or the designed environment.

The qualitative aspects of user experiences for the two major alternatives for the Delaware Water Gap National Recreation Area, with and without a dam, are discussed in Chapter XVIII. But in general, the term "Recreation Area" begins to set user expectations itself. While a limited number of National Recreation Areas currently exist and few potential users have formed a firm idea of what such an area is, it is safe to assume that use of the term suggests activities, participation in outdoor experiences generally more active than would be suggested by the term "nature preserve." The introduction of the variable of building or not building a dam begins to set other expectations. The dam implies lake; lake implies boating, swimming, still water and serenity. No dam implies river; movement, constant change, rapids, excitement, and silent power are easily associated with the concept of a river. Dam may also imply man-dominated, harnessing the force of nature, and conquering the river.

IV.B.4. PROGRAMMED RECREATION FACILITIES

IV.B.4.(a) Scope of Programmed Facilities

Major existing facilities were determined primarily by a review of state park systems and federal parks. Facilities presently on capital budgets plus those planned to be in place by 1980 were determined. General emphasis was placed upon water related recreation facilities and specific emphasis was placed on comparable facilities located at dam-based impoundments. Thus, dams within the recreation service area built by power companies (sanctioned by the Federal Power Commission, New York City), the Soil Conservation Service, Upper Darby, Pennsylvania (under 25,000 acre feet impoundments) and U.S. Army Corps of Engineers, Philadelphia, Pennsylvania (over 25,000 acre feet impoundments) were examined. The status of Gateway National Recreation Area was also determined.

Facilities projections are limited to those provided by the public sector. This is due to the assumed volatility of the private recreation market. One exception is Great Adventure, New Jersey, a zoo facility with expected 1975 visitation of 3,000,000 visitors. Green Acres and Project 70, the New Jersey and Pennsylvania, respectively, open space bond issues will have an impact on recreation facilities, but the extent is presently unclear.

IV.B.4.(b) Gateway National Recreation Area

Gateway National Recreation Area, operated by the National Park Service at New York Harbor experienced 5.1 million annual visitations during its first

full season (1974) and attendance is forecast at ten million by 1980. This facility contains 6,000 acres in Queens (Jamaica Bay Bird Sanctuary), Brooklyn (shorelands and Floyd Bennett Field), Staten Island and Monmouth County (Sandy Hook). No conceptual plan regarding facilities mix exists at present, but development will primarily utilize present in-park resources including huge hangars, historic sites and beaches. In 1974, Sandy Hook and Riis Park beaches, respectively, experienced 800,000 and 2,500,000 visitors. It is assumed annual visitation at these facilities will rise at a slow rate through 1980.

IV.B.4.(c) Dam Based Facilities

Notable increases in visitation are prospected for Lake Wallenpaupack, Yards Creek and Schoharie Creek impoundments. These will total approximately 500,000 annual visitations for swimming, boating, camping, picnicking and hiking.

Presently Lake Wallenpaupack in Pike and Wayne counties, Pennsylvania (5,700 water acres) provides 11 boat ramps with an estimated 3,500 registered boats. An estimated 4,000 summer cottages surround this lake. Motorboat crowding at this facility is legendary, with popular rumor being that swimmers are prevented from using the lake due to the boating hazards. Presently, the five-acre beach is over-utilized by ten percent. There are 157 picnic tables and 300 tent sites, each used to capacity. Ten acres of beach, 150 additional picnic tables, 12 miles of trail, and approximately 65 camping sites are to be added.

Holtwood Dam, Lancaster County, Pennsylvania (2,400 water acres) facilities expansions include 335 picnic tables in addition to the present 633, and 300 additional campsites in addition to the present 156, and one boat ramp in addition to six existing ones.

According to Federal Power Commission Licensed Projects, Recreation Reports for 1973 and 1974, Yards Creek Upper and Lower Reservoirs (300 water acres) are expected to increase from 10,000 present annual visitations to 250,000. No information is available on future facilities envisioned, but present sites permit sightseeing and picnicking, hiking and group boy scout camping.

Schoharie Creek Dam, Schoharie County, New York (430 water acres) envisions an increase from the present 20,000 annual visitations to 72,000, with 12,000 being overnight campers. The facility presently contains 100 campsites, one swimming pool and one boat launch ramp at 100 percent capacity.

IV.B.4.(d) Pennsylvania State Parks

Pennsylvania envisions significant additions to its extensive network of state park facilities by 1980. Within the recreation service area, approximately 3,250 lineal feet of beach, 62,000 square feet of pool area, 1,175 campsites, and facilities for 700 boats will be added by 1980.

Significant beach area will be added to Blue Marsh Park, Berks County (800 feet), Swatara Gap, Lebanon County (800 feet), and Nescopeck, Luzerne County (700 feet).

Large swimming pools will be installed at Jacobsburg, Northampton County (15,000 square feet), Marsh Creek, Chester County (10,000 square feet), and Nockamixon, Bucks County (25,000 square feet). Camping will be significantly increased at Nockamixon, Bucks County (600 sites) and Hickory Run, Carbon County (400 sites). Boating ramps will be installed at Neshaminy, Bucks County (600 boats) to coincide with improved Delaware River water quality. Additional boating and picnicking will be provided at Beltzville in Carbon County.

IV.B.4.(e) New Jersey State Parks

Relatively few additions to the New Jersey State Park System are contemplated or programmed presently. State policy is to provide facilities in proximity to urban regions with mass transit access with currently available funds.

Approximately $50,000,000 available through the Green Acres Bond Issue (approved November 1974) and $15,000,000 available through the Bureau of Outdoor Recreation is expected to be the major funding of New Jersey state park facilities. Based on 1975 costs, this translates to 910 linear feet of beach, 1,300 campsites, 1,625 picnic tables, 23 boat ramps, and 65 miles of hiking and nature trail. An additional $150,000,000 will also be available through Green Acres for state and local developments.

Spruce Run and Round Valley, both in Hunterdon County, are undergoing expansion. Round Valley will be officially opened with all facilities operating by July 1976. Both parks offer, or will in the near future,

boating, picnicking, swimming and camping activites in addition to various other day use activities. Neither park will be developed to full capacity. Chapter XIII discusses further expansion potentials.

The present major planned facility is Liberty Park along the Hudson River at Jersey City (Hudson County). While still in the conceptual design stage, this park will cater to urban needs and form a suitable backdrop for the nearby Statue of Liberty. It is likely promenades, huge swimming pools, public forums, court games and environmental education will constitute major areas. This park will be similar in many ways to Roberto Clemente Park along the Harlem River in New York City.

Additional local facilities will be funded through the Green Acres Program. The actual mix and amount of facilities built under this program is unclear at this time. There are also opportunities to increase the ocean beach capacities, exemplified by a current suit by New Jersey against the Boroughs of Deal and Bayhead.

IV.B.4.(f) New York State Parks

Relatively few additions to the New York State Park system are contemplated or programmed at this time due to budgetary constraints. State policy will generally focus on providing recreation close to urban centers and specifically along the Hudson River corridor between New York City and Albany.

Of most significance is the anticipated tenfold increase in Hudson River Boating due to improved water quality. Small craft on a typical summer

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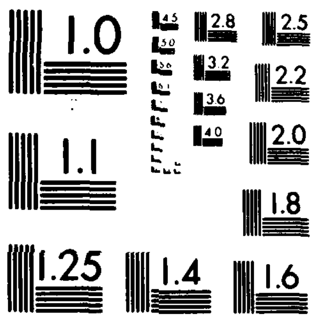

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Sunday are expected to increase to 4,000 to 5,000 by 1980 from present levels of 450 to 500.

Iona Island in the Hudson River, and a portion of Harriman State Park in Rockland County, will be developed to accommodate 8,000 daily visitors by 1980, with a significant percentage using a large swimming pool. Below Iona, a large pool will be constructed in Blauvelt State Park, part of the Palisades Interstate Park System. In Putnam County, the Hudson Highlands State Park will contain a 200-foot beach projected to be in operation by 1980.

Improvements in the vicinity of New York City are expected to take the form of urban riverside parks, with large swimming pools, extensive promenades, environmental education, court games and performing arts activities. The facilities mix will be significantly different than in rural state parks. The prototypical example is, again, Roberto Clemente Park along the Harlem River in New York City.

The only significant facility programmed elsewhere in the New York portion of the recreation service area is Oquaga State Park (Delaware County). This day use facility will center on a small impoundment on a tributary to the Delaware River near the conjunction of Delaware, Broome, and Chenango Counties. By 1980, swimming and picnicking facilities and hiking trails will be provided. No specific facilities are programmed at Upstate New York City reservoirs, including Ashokan (Sullivan County), Pepacton (Delaware County), Rondout (Sullivan County), and Croton and Kensico Reservoirs (Westchester County). Consideration of potential facilities is discussed in Chapter XIII on recreation alternatives.

IV.C. DEMAND FOR RECREATIONAL FACILITIES

Subject to the qualifications concerning the state of the art of recreation demand forecasting expressed in the preface to this chapter, this section presents an analysis of demand within the recreation service area of the Tocks Island Lake Project and also presents some observation on the characteristics of recreation demand more generally. This section contains five major parts. The first reviews the demand forecasting history of the project; the second describes the consultant's approach and data base; the third discusses some of the demographic differences in recreation preferences; and the fourth goes into some detail on the utilization (expressed demand) of four comparable facilities in the region. Finally, these components are translated into a forecast of the service area's recreation demand in terms of activity days for various recreation categories.

Some definitions of terms should be noted before getting further into this section. The basic measure of demand or utilization is the "activity day" which means one person participating in a given activity on one day. Because a person may partake in more than one activity in a day (both swimming and picnic, for example), the total visitation (annual) or visitor days at a park will be less than the sum of the activity days.

By contrast the standard supply terms are "design load" (or "instant capacity") which describes the number of people a facility or group of

facilities can accommodate at any one time. The "daily capacity" is determined by multiplying the instant capacity by a turnover factor; and conversely the design load can be determined by dividing some predetermined "design day" (visitors on the peak day, or average Sunday, or fifth-highest day or whatever) by a turnover factor.

IV.C.1. PAST RECREATION DEMAND ESTIMATES FOR TOCKS ISLAND LAKE

Throughout the history of the planning for the Tocks Island Lake Project and the associated Delaware Water Gap National Recreation Area there have been many reevaluations and adjustments made to the details of the recreation component, particularly in the design capacity of recreation facilities and the projected visitation to the area. In order to set a framework for the development of demand estimates called for in this present study, a brief review of the past efforts and the assumptions inherent in them is necessary.

The basic recreation demand methodology and the first estimates of visitation were developed in House Document #522 which set forth the total project formulation. This document contains a description of the only "demand" as opposed to "capacity" approach to visitation. The basic assumption in the analysis is that the Tocks Island project as proposed would most resemble a state park in its recreation component and it therefore used historical trends in state park attendance in Pennsylvania, New Jersey and

New York as a indicator of demand. A factor of 1.555 state park visits per capita in 1955 was projected to 2.235 in 1965 and 5.407 in 2010 based upon the then recent trends in visitation.

This forecast has proven to be generally accurate as shown in the table below for 1973.

Table 4-20 Total State Park Visitations Per Capita 1973

	Population	State Park Visitation	Park Visits Per Capita
New York	18,265,000	46,907,000	2.57
New Jersey	7,361,000	3,519,088	0.48
Pennsylvania	11,902,000	30,109,619	2.53
Total	37,528,000	80,535,707	2.15

Source: Various state departments.

Total demand within the then defined service area was calculated by multiplying these ratios by projected population. This total visitation was then converted to day design load (or "instant capacity" of recreation facilities) based on a formula which has been consistently used, in its components if not specific numbers, throughout the years. This formula is:

$$\text{Design Load} = \frac{\text{Annual Visitation} \times .80 \times .60}{14 \times 1.5}$$

in which the .80 represents the share of annual visitation which occurs during the normal season, 14 is the number of weeks in the normal season, .60 is the share of the weekly attendance occurring on a Sunday (conceded

to be the peak day for most activities), and 1.5 is the turnover of facilities on the average Sunday.

Using this formula and adding a factor for estimated overuse of existing facilities at the time, the study forecast a design load need for about 750,000 visitors in 1965 and over 2,800,000 in 2010 as the potential market for recreation at Tocks Island Lake. This "effective market" was factored out of the total service area needs by adjusting for distance from Tocks Island. It included 100 percent of the needs within a 25-mile radius of the site and used variable percentages down to 42 percent of the need in the population band between 75 and 100 miles from the site. Other documents reinterpreted these figures as indicating a potential market of 15,000,000 visitors annually in 1955 and 25,000,000 annual visits in 1975.

Clearly the design of recreation facilities at Tocks Island Lake could not accommodate this number of visitors (nor could any one facility capture 100 percent of its potential market, a point never discussed in the analysis); so from this point on demand or needs have been essentially ignored and the design load has been placed in the above equation to determine a projected visitation level.

Appendix W of House Document #522 projected a total annual attendance of 6,750,000 visitors to facilities with a design load of 154,300 persons at any point in time.

The document later made an adjustment for "sightseers" as opposed to people actually using the recreation facilities. It assumed that 20 percent of the visitors would only be driving through and consequently settled on a design load of 123,500 persons.

The next projection of visitation was developed by Robert R. Nathan Associates in their 1966 study for the National Park Service, Potential Impact of the Delaware Water Gap National Recreation Area on its Surrounding Communities. This report developed a visitation estimate of 10,500,000 annual visitors which has since become, until recently, the most widely quoted figure for visitation at DWGNRA. Actually, this was a middle figure among a range of forecasts Nathan developed. It is based on a design load of 123,500 visitors at any point in time applied to the formula described above except that the Sunday visitation was decreased from 60 percent to 29 percent of the weekly visitation and turnover was reduced to 1.13. The changed Sunday figure was based on some comparable experience in nearby parks and the turnover was reduced to reflect the increased distance (and presumed longer stay) at DWGNRA. The 8,400,000 annual visitors determined by the formula was then increased by 25 percent to account for sightseers.

The next milestone in recreation planning for the project occurred in the February 1968 publication by the Corps of General Design Memorandum Supplement #1 of the project. Appendix E notes the discrepancies between the two previous documents and uses slightly adjusted factors in the formula

to develop an estimate of 9,568,600 annual visitors of which 20 percent would be sightseers and another 68 percent would be in the water-related activities. This figure is the "official" figure which has been used in the Corps benefit-cost analysis and is based on a design load of 112,000 visitors at one time. This document also forecasts an increase in visitation to over 16,000,000 anually by 2010 but did not discuss increased design load and did not use the increased visitation in the benefit-cost analysis.

The next document discussing recreation design was the May 1971 draft Master Plan for the Delaware Gap National Recreation Area developed by the National Park Service. This document noted the previous forecasts but did not contain any detailed design criteria and was apparently addressing the previous design load of 112,000.

In response to concern about the potential impact of the forecast number of visitors, the Delaware River Basin Commission adopted Resolution 73-6 in 1973 which amended the Comprehensive Plan to permit recreation and facilities designed to accommodate no more than 4,000,000 visitors per year. Clark & Rapuano are currently preparing a revised plan for the DWGNRA with a design load of 41,700 in the first phase. This is designed to produce 4,000,000 visitors per year using the same basic formula above with 20 percent of the total visitation as sightseers, 26.2 percent of the weekly visitation on a Sunday and a turnover of 1.15. The plan under preparation also details a second and third phase which would bring the ultimate

capacity to a 110,500 design load and 10,600,000 total annual visitations although it should be noted that additional authorizations and amendments to the DRBC Comprehensive Plan, which in turn require public hearings, will be necessary to develop DWGNRA beyond the proposed Phase I.

This summary of the development of recreation forecasts for the project indicates several major points. First, there has been no analysis of recreation demand or needs in the region since the original studies preceding House Document #522. Second, all of these analyses used a stock formula which applied to total visitation and design load for the project without any consideration for different activities or different mixes of activities that might occur and would certainly affect the ratios used in the equation. Finally, the question of the design load itself is never addressed and the persons per picnic table or acre of water or whatever often reflects more of a desired standard than a real capacity limit. The question of the design standards is addressed elsewhere in this chapter but the remainder of this section deals with the consultant's relook at recreation demand and the need for additional facilities in the recreation service area.

IV.C.2. AN APPROACH TO RECREATION DEMAND FORECASTING

This portion of the chapter describes the approach the consultants have taken in forecasting recreation demand in the Tocks Island Lake recreation

service area previously described. Included in this section are a discussion of the empirical base for demand forecasting as generally used and as used in this study, various adjustments that have been made to the raw data to reflect conditions in the service area and an outline of the methodology and assumptions used in this study.

IV.C.2(a) Empirical Base

In recent years there have been three major studies of the national recreation market conducted by the Federal Government: one in 1960 conducted for the Outdoor Recreation Resources Review Commission (a predecessor agency to the Bureau of Outdoor Recreation); one in 1965 conducted for the Bureau of Outdoor Recreation; and, the most recent, in 1972 also conducted for the Bureau of Outdoor Recreation. While these surveys differed somewhat in their definition of categories and approach to questioning they are essentially comparable although the 1972 National Recreation Survey was limited to activities in the summer quarter (June, July and August) while the other surveys covered different periods of time. These surveys all covered a full range of demographic and geographic factors and tabulated results for regional areas of the country. The 1960 and 1965 surveys have provided the basis for much of the recreation planning which has been done in various states and regions since that time. The 1972 survey is too new to have been utilized to any great extent.

Beyond these national studies, many local and state recreation programs have made use of surveys conducted in the locality or specific "case study"

surveys of facilities already in place. Some of the most extensive recreation analysis and planning being done today is by the various states in the development of their Statewide Comprehensive Outdoor Recreation Plans (SCORP) required by the Bureau of Outdoor Recreation for participation in the federal Land and Water Conservation Fund Program. Most relevant to the demand in the Tocks Island Lake recreation service area are the demand studies done by New York, New Jersey and Pennsylvania. The demand figures in New York's SCORP are derived from a number of sources but rely most heavily on two surveys, one conducted in Onondaga County in the winter of 1968 and one conducted on Long Island in the summer of 1968. New Jersey's SCORP demand projections were factored from the 1960 National Recreation Survey based on regional summaries and state demographic characteristics. Pennsylvania's 1971 SCORP (a new one is now in preparation) also relied on demographic-based adjustments to the regional data of the 1960 NRS. It is obvious that the underlying demand studies are somewhat dated and are either of a too limited an area or too broad an area to apply directly to the Tocks Island Lake recreation service area. The consultants are fortunate, however, in being able to utilize a yet-to-be-published survey conducted in the summer of 1974 by Ide Associates, Inc. of Philadelphia for the Commonwealth of Pennsylvania in the update of their SCORP.

This survey was conducted by telephoning approximately 3,000 households in Pennsylvania (compared to 4,029 households in the whole country covered in the 1972 NRS.) The recreation participation in 19 outdoor-oriented activities was obtained from a randomly selected individual five years of age or

or older in each household. Interviewers worked from a computer-prepared listing of telephone numbers each of which had an associated random number table which designated a particular person in an age-ordered listing of household members obtained at the start of the interview. If the designated individual was ten years of age or older that individual was interviewed on his or her recreation participation. If the individual was from five to nine years old, an adult member of the household, generally the parent, was interviewed about that person's participation. In addition, a household head was interviewed to obtain attitudes on recreation and the socioeconomic characteristics of the household.

The broad coverage of the Ide Associates survey and the wording and the order of the questions resulted in some substantial differences between its results and those of the 1972 National Recreation Survey; most significantly, the Ide Associates survey indicated a greater participation in terms of total activity days in most of the recreation categories. The differences are partly accounted for by the fact that the Ide Associates survey covered the whole year and covered all persons five years of age and over whereas the 1972 NRS covered the summer months only and was limited to persons 12 years and over. The principal reason for the differences, however, is that the 1972 NRS (and the 1960 and 1965 surveys before it) focused on vacations, trips and outings whereas the Ide Associates study focused on the activity itself and total participation over the year. Not unexpectedly, the greatest differences in participation rates between the two surveys are for

such activities as bicycling, swimming and outdoor games and sports which are most frequently engaged in near the home. Correspondingly there is in the Ide Associates survey a more rapid falloff in the curve which describes the percent of activity days which are engaged in at varying distances from the home.

For example, when the data from the Ide Associates survey is factored to exclude activities undertaken within 15 minutes of the respondent's home, the results are very similar to other surveys and standards used in recreation planning. The table below shows activity days per capita in the major recreation categories most relevant to planning DWGNRA.

Table 4-21 Activity Days Per Capita for Seven Major Recreation Categories

	Ide Associates 1/	SCS Guidelines	1972 NRS
Swimming	8.78	8.5	6.30
Picnicking	4.64	4.4	2.77
Boating	2.00	1.8	1.53
Fishing	3.15	2.4	1.30
Hunting	1.16	n.a.	.11
Hiking	3.77	1.6	1.30
Camping	2.59	.6	1.48

1/ Activity days more than 15 minutes from home.

Source: Ide Associates, Inc. survey of Pennsylvania residents, 1974; Soil Conservation Service planning guidelines based largely on Northeast Region results of 1965 NRS; and calculated from 1972 NRS data.

The differences in the participations shown in the 1972 NRS and the other two can be accounted for largely by the fact that it covered only the summer months; for example, the closest correlations are in boating and swimming while hiking and picnicking show extended seasons and hunting, of course, is not "in season" during the summer.

Another important advantage of the Ide Associates survey is that it was undertaken in 1974, a year in which recreation and travel patterns reflected a greater public concern for the cost and availability of gasoline. Attendance at State Parks, for example, was down three percent between 1973 and 1974 in both Pennsylvania and New Jersey. By utilizing base year demand figures in this study which reflect the impact of the energy crisis, a more realistic picture of future demand is obtained.

IV.C.2(b) Adjustments to the Base Data

The consultant, working in close association with Ide Associates, developed methods for adjusting the base survey data to make it applicable to the recreation service area of Tocks Island Lake. Two separate types of adjustments were made, one based on demographic characteristics and a second based on recreation supply available to residents of a particular county. The principal intent of these adjustments was to make the findings of the Pennsylvania survey applicable to residents of other states in the recreation service area. While it is clearly inappropriate to use overall participation rates in a given activity per household or per capita uniformly for each county within the service area it is not inconsistent to assume that

the persons in different areas who are of the same age, have the same income, do or do not have access to a car and have similar recreation opportunities available to them will behave in a similar manner.

Therefore, the results of the Ide Associates survey in Pennsylvania were used to calculate, for each activity, separate participation rates in several demographic categories which were then applied to the actual and forecast demographic characteristics in all of the counties in the service area to determine a demographic-expected participation rate. Demographic characteristics included the white/nonwhite split, car ownership, age (seven categories) and income (six categories). These same participation ratios were applied to future populations and their associated demographic characteristics in the forecasts so that forecast participation rates in fact reflect changes in the age and income structure of each county.

Demographic characteristics selected for this analysis were chosen based on their influence on the recreation participation and limited by the need to tie in with characteristics determined in the Pennsylvania survey. For example, the male-female distribution of population does not influence the overall participation rate of a county because of the narrow range of variation in this measure from one county to the next -- even though the recreation activities of males and females are quite different. The degree of urbanization of a county would seem to be an important influence on recreation participation but it was not possible to tie this measure into the existing data base; it is felt that the vast differences in participation

between white and nonwhite persons and those who have and do not have access to a car (two measures which were used) will adequately weight the urban participation rates. Notwithstanding such qualifications, the consultants feel the Ide Associates survey is the most up-to-date, comprehensive and accurate survey available for use at this time.

The other important adjustment concerns the supply of recreation facilities available to an individual as this certainiy influences his rate of actual participation in various recreation activities. It is a consistent theme of academic literature discussing recreation demand that any survey based on actual use of existing recreation facilities cannot adequately describe the pure demand in economists' terms; and any forecasts developed from these rates are in fact forecasts of consumption with an implied assumption that future supply opportunities will be about the same as they are now. While this may be a problem for some specific activities (such as skiing) which are highly facility-oriented, it may be an overstated concern over the long run since the broad outdoor recreation patterns of a region are determined by its terrain and climate and geologic features (aside from demographic characteristics). While it is true that no facility directly comparable to the Tocks Island Lake Project exists today, there are ample mountain lakes, hiking trails, campgrounds and the like in the surveyed area. It is important, however, to recognize supply differentials among the various portions of the recreation service area in developing the basic and forecast participation rates in the various activities. To address this issue the consultants have utilized a method developed by

Ide Associates, Inc. for use in Pennsylvania SCORP now in preparation which can be briefly described as follows. First, the supply inventory (described in Part IV.B. above) was organized to present for each of seven major recreation categories a relative measure of the supply present in each county. This measure was then divided by each county's share of the total population in the service area to determine a "supply accessibility index" -- an index of greater than one indicated a county had a greater share of the recreation supply than the population, indicating a relative capacity to serve neighboring counties. (This, or course, does not address the question of overall adequacy of supply, nor is that the intent of this step.) The supply accessibility indexes surrounding each of the counties in the service area (taken one at a time) in time bands of 30-minute intervals ranging up to two and one-half hours away are compared through a regression analysis to the ratio between the actual participation rates in the county (as determined by the Ide Associates survey) and the demographic-expected participation rates as calibrated from the overall survey results. This then produced an equation which allowed the present and forecast participation rates to be adjusted to reflect various assumptions regarding future supply.

The complete set of printouts of the analysis are in the project files. The appendix to this chapter contains the more pertinent output tables of this analysis and are referenced within the text of this chapter. Although the analysis was done on a county-by-county basis, the summary tables presented in the text of this chapter are presented for states, the recreation service area or, in some cases, important county aggregations.

The appendix tables and their content are briefly described below.

Tables 4.A.1 and 4.A.2 display the estimated 1974 demographic characteristics for the counties within the recreation service area. The characteristics include total population, age distribution, white and nonwhite distribution, household income distribution and distribution among those in households with and without an automobile. Because of the nature of the survey and computer program, the distributions shown in these tables are of population aged five and over.

Tables 4.A.3 and 4.A.4 show the forecast of these characteristics by ten-year intervals through 2025 for the portions of Pennsylvania, New Jersey, New York, Connecticut and Delaware which lie within the recreation service area. The main tables correspond to the medium growth level described in Chapter I and the a and b portions of the tables present data for the low and high growth forecast, respectively. Though not shown in the appendix, these forecast were developed on a county-by-county basis and it is these demographic factors to which specific participation rates were applied.

Tables 4.A.5 and 4.A.6 show the demographic-specific participation rates determined by the Ide Associates Survey. Each demographic-specific rate shown in these tables was applied to the forecast county demographic characteristics and a regression analysis was used to weight the resulting participation measures for each recreation activity in each county to derive an overall rate.

Table 4.A.7 displays the results of this forecast procedure in terms of the total participants and total activity days in each activity and each county for the forecast years. Again, the a and b portions of the table corresponds to the low and high growth assumptions described in Chapter I. It should be noted that this is participation in recreation activities by residents of the specified county without regard to where that participation takes place.

Table 4.A.8 displays the "supply accessibility indices" for each of the counties in the recreation service area for each of seven major activities. The index shown for the 30-minute bracket, for example, is the percent of the service area's supply divided by the percent of the service area's population which exist in the group of counties lying within 30 minutes of the specified county; the index shown for the 60-minute category is a similar measure for the band of counties lying between 30 and 60 minutes; and so on to the 150-minute index which represents the supply to population ratio in the group of counties lying between 120 and 150 minutes from the specified county. A low factor in this table in the closer time bands indicates a relative need for new facilities as described above.

Table 4.A.9 shows for each of 12 recreation categories the percent of the annual activity days which occur greater than a specified distance (expressed in minutes) from the person's residence. This is the "travel time decay" function which is referred to elsewhere in this chapter. By applying the appropriate percentage factor to total demand in each county in the

recreation service area, the activity days which are a part of the potential "market" for DWGNRA can be calculated.

Table 4.A.10 shows the result of this calculation. The activity days shown in this table are those generated by residents of each county which would take place at a distance at least as great as DWGNRA is from that county. As such, this number represents the total potential market for which DWGNRA must compete -- but must compete only with other facilities at the same or greater distance. In other words, the great bulk of the activity which takes place near the home or at facilities closer than DWGNRA is eliminated leaving a realistic assessment of the demand for facilities at DWGNRA.

The actual forecast numbers developed through this analysis are discussed in IV.C.5. following a discussion of demographic differences in recreation participation and some reasonably comparable facilities in the region.

IV.C.3. CHARACTERISTICS OF PARTICIPANTS IN OUTDOOR RECREATION

This part describes variables in the demographic characteristics of participants in various outdoor recreation activities. The tables below are national data for the summer of 1972 as determined by the Bureau of Outdoor

Recreation in the 1972 National Recreation Survey described earlier. The consultant has calculated the activity days per capita for various characteristics using data published by BOR; but these figures themselves have not been published before. These results also have been compared to the results of the Ide Associates, Inc. 1974 survey of Pennsylvania residents and there is a striking similarity in the results -- not in the number of activity days (as previously discussed) but in the relative participation among different population groups.

IV.C.3.(a) Sex

Between men and women there are no real surprises as to participation among the various activities. For the more family-oriented activities -- swimming, picnicking, hiking, camping and to some extent boating -- there is no sizeable difference between male and female participation rates. However, the traditional male pursuits of hunting and fishing show substantially higher activity by men -- ten times more for hunting and over two and one-half times as much for fishing. The table below shows activity days per capita for men and women for all seven of the major activity categories.

Table 4- 22 Activity Days Per Capita by Sex

	Male	Female
Swimming	4.5	5.1
Picnicking	2.4	2.7
Boating	1.8	1.2
Fishing	2.6	1.0
Hunting	.2	.02
Hiking	4.2	4.4
Camping	1.5	1.2

IV.C.3.(b) Age

The table below shows activity days per capita among the major categories for four age groups. All activities exhibit an expected decline in participation rates as the population ages -- except for momentary increases in picnicking and fishing in the move from the under 24 age group to the 25-44 category. As also anticipated, the more strenuous activities such as swimming, hiking, camping and hunting showed the greatest decline as participants age. Picnicking and fishing exhibited the most consistent participation rates among all age groups.

Table 4-23 Activity Days Per Capita by Age

	Under 24	25-44	45-64	65 and Over
Swimming	10.1	4.8	2.0	.5
Picnicking	2.7	3.5	1.9	1.2
Boating	2.1	1.7	1.1	.3
Fishing	1.9	2.1	1.5	1.2
Hunting	.2	.11	.09	.05
Hiking	2.1	1.1	.8	.3
Camping	2.0	1.7	.9	.3

IV.C.3.(c) Education

Activity participation rates among those with some college background and those with a high school degree or less differ substantially for several activities. The college group participates in boating and hiking at more than twice the rate of the noncollege group. Meanwhile, the noncollege group participates in hunting at five times the rate for the college group. The table below shows activity days per capita for college and noncollege participants among the seven categories.

Table 4-24 Activity Days Per Capita by Education Level

	College	Noncollege
Swimming	6.9	3.8
Picnicking	3.3	2.4
Boating	2.6	1.0
Fishing	1.2	1.8
Hunting	.02	.1
Hiking	2.2	1.0
Camping	1.9	1.6

IV.C.3.(d) Race

Activity participation rates among whites and nonwhites vary markedly in most of the categories. The table below shows activity days per capita for whites and nonwhites for all seven major categories. Gaps between participation rates by whites and nonwhites are greatest for boating (whites ten times more frequent), camping (whites eight times more frequent) and hunting (whites four times more frequent). Nonwhite participation rates for fishing and picnicking are closest to those for whites.

Table 4-25 Activity Days Per Capita by Race

	White	Nonwhite
Swimming	5.2	2.0
Picnicking	2.7	1.7
Boating	1.7	.17
Fishing	1.9	.9
Hunting	.12	.03
Hiking	1.4	.5
Camping	1.6	.2

IV.C.3.(e) Income

The table below shows activity days per capita for two income categories.

Table 4-26 Activity Days Per Capita by Family Income

	Under $6,000	$6,000 and Over
Swimming	2.8	5.6
Picnicking	1.6	2.9
Boating	.6	2.8
Fishing	1.6	1.9
Hunting	.06	.13
Hiking	.8	1.6
Camping	.6	1.7

Boating and camping are the only two activities with substantially higher participation rates among those with higher incomes -- four times more frequent for boating and almost three times as much for camping. For all but one (fishing) of the remaining five activities, participation by lower income people is about one-half that of higher income people. Income appears to make little difference in participation rates for fishing.

IV.C.3.(f) Car Ownership

One of the most limiting factors in recreation participation seems to be access to automobile, and these differences are undoubtedly responsible for much of the variation in the race and income participation rates discussed above. The table below, taken from the 1974 Pennsylvania survey (comparable data is not available from the 1972 NRS) shows the activity day per capita for persons who are in households which have one or more cars and those who are not.

Table 4-27 Activity Days Per Capita by Availability of Automobile

	Car	No Car
Swimming	21.6	7.0
Picnicking	7.6	4.7
Boating	2.7	.52
Fishing	4.9	1.5
Hunting	2.4	.01
Hiking	7.6	4.7
Camping	3.0	.29

IV.C.4. CASE STUDIES OF COMPARABLE PROJECTS

Recognizing that no other recreation area is identical to the proposed Tocks Island Project, the study of comparable recreation areas can nevertheless provide insight necessary to project future levels of utilization, visitor origins, optimum design levels and the like. Because of the differences such as location, size, and activities offered, value judgments must be made to adjust for these differences and these value judgments are almost aways going to be subjective. With these inherent limitations and weaknesses notwithstanding, this methodology offers a partial tool for analysis.

Four sites were chosen for comparative analysis, each for a different reason, and two are within the recreation service area and two are not. Even those two outside the service area are at approximately the same latitude and have comparable "seasons" for various activities. These two, Pymatuning Reservoir in western Pennsylvania and the Allegheny Reservoir (Kinzua Dam)

in central Pennsylvania were chosen primarily for their size and activity mix -- the water acreage at each exceeds the proposed 12,000 acres at Tocks Island. Both have visitations in the multimillions. Beltzville in nearby Carbon County, was chosen because it is a new major facility near the impact area and one of only a few state parks in Pennsylvania at which there is not a limit on boating horsepower. Bear Mountain and Harriman parks in the Palisades Interstate Park System were chosen because of their role as a major day-trip destination within the New York urbanized area at a distance only slightly closer than DWGNRA would be.

In the course of the investigations each site was visited in order to gain a reliable firsthand impression of the area and its facilities. The data collected was provided by the appropriate governing body, and interviews with park officials were conducted in order to provide the necessary background information and understanding. It was hoped that each recreation area would be able to provide comparable data on capacities, utilization etc.; however, such was not the case for a number of reasons. Beltzville and Pymatuning were the most alike in the level of detail and breadth of information because they both operated under the same governmental organization, the Pennsylvania State Parks system. However, even these parks varied somewhat in their visitor origin and user survey data. The data for Bear Mountain/Harriman and Kinzua was lacking in detail and neither could provide daily attendance either in total or by activity.

IV.C.4.(a) Beltzville

Beltzville is a Pennsylvania State Park located in Carbon County about 25 miles southwest of Stroudsburg, Pennsylvania. The park contains 2,060 acres of land area and a 947-acre lake created by a Corps of Engineers dam. Beltzville is one of the newest parks in the state and opened for operation in April 1972 and is one of a few state parks to allow unlimited horsepower motorboating. Even though the park is designed and operated for day use only, it has enjoyed a substantial increase in yearly attendance. Total visitor days in 1974 were 430,910, up from 404,776 in 1973 which was the first full year. Beltzville offers a wide variety of year-round outdoor recreation activity as indicated in the following table.

Table 4-28 Activities and Available Facilities, Beltzville State Park, 1975

Activities	Facilities
Picnicking	400 Tables
Swimming	525 Linear Feet of Beach
Fishing	10 Miles of Shoreline
Boating/Waterskiing	947 Water Acres
Hiking	6.5 Trail Miles
Ice Skating	2 Acres (plowed)
Nordic Skiing/Snowshoeing	2,060 Acres
Ice Fishing	947 Acres
Sledding/Tobogganing	4 Acres
Hunting	1,707 Acres
Snowmobiling	2,060 Acres

Source: Pennsylvania Department of Environmental Resources.

Planned new facilities for Beltzville include a Corps of Engineer proposal for a new picnic area of unknown size and a complete camping complex.

From the daily attendance figures it is possible to evaluate the utilization of the park and its facilities. The summer season runs from Memorial Day to Labor Day and is approximately 14.5 weeks in length. On the average, 75 percent of the total annual visitation occurs during that time. This has fluctuated from a low of 60 percent to a high of 85 percent in 1973 and 1972, respectively. Approximately 30 percent of the total weekly visitations occur on Sunday, with 20 percent occurring on Saturday, and the remaining 50 percent occurring during the weekdays. The annual peak day accounted for just over three percent of the annual visits. The fluctuation in the percentage of summertime visitors and the fairly high annual peak day percentage is undoubtedly due to visitor unfamiliarity with peak full times for Beltzville. As the newness of the park wears off and people become more aware of the peak times, the distribution of annual visitation will assume a more normal pattern. This trend is already beginning to emerge and can be seen in the decline in the number of people turned away as indicated in the following table.

	Days Gates Closed Early	Car Turnaways	Boat Turnaways
1972	8	2,300	114
1973	18	761	1,816
1974	21	500	1,010

Utilization and turnover of facilities varies by activity. The following table depicts the utilization of four of the most popular activities in comparison to the current capacity levels of the park.

Table 4-29 Activities, Capacities and Utilization of Selected Activities at Beltzville State Park, 1972-1974

Activity	Instant Capacity	Peak Day Utilization 1/ 1972	1973	1974
Picnicking	2,000	3,600	2,200	4,000
Swimming	2,100	4,500	4,700	4,500
Bank fishing	875	1,000	1,600	3,000
Boating	2,700	2,500	2,000	3,000

1/ Activity days.

Source: Pennsylvania Department of Environmental Resources

As might be expected, the turnover on picnicking, swimming and fishing is much higher than for boating, due to the nature of the activity. Boating has a definite critical threshold of capacity and a positive limit of launching facilities which causes park officials to turn away boats when the design capacity is reached. This can be contrasted to the excessive overuse on Pymatuning, discussed later, where there is no such restriction.

An indirect constraint to utilization is of course parking. Beltzville provides parking spaces for 900 cars and an additional 175 boat trailers, which translate to an instant capacity of 3,200 people based on a ratio of 3.55 people per car. This is certainly not a rigid constraint in that cars

can be and are parked along roadsides and in meadows, but parking can be a constraining factor on a typical summer Sunday.

According to two different surveys taken in July of 1973, the following was the resultant distribution of visitor origins:

	Boaters Survey	Total Survey
Carbon County	21%	25%
Northampton County	18	16
Lehigh County	13	29
Bucks County	13	2
Philadelphia County	10	0
Schuylkill County	10	4
Montgomery County	5	3
Others	10	21
	100%	100%

In the "other" category of the boaters survey, two-thirds of the ten percent were from out of state, while a smaller share of the 21 percent of all visitors were from out of state. Even though Beltzville allows unlimited horsepower motorboating its "market penetration" is somewhat low. The most likely reason for this is its rather small size and relative newness; but as it becomes more well known, increasing numbers of visitors will recreate at Beltzville.

IV.C.4.(b) Pymatuning

Pymatuning is a Pennsylvania State Park located in Crawford County about 40 miles southwest of Erie, Pennsylvania on the Pennsylvania/Ohio border. Pymatuning contains 8,745 land acres and 17,088 water acres. Lake Pymatuning

was created by a Corps of Engineers dam which was completed in 1936. Reported attendance in visitor days has fluctuated significantly from 6,800,000 in 1969 to 2,990,000 in 1974. Some of this decline is attributable to revised visitor estimating procedures enforced by a new park superintendent. However, the recent decline in 1974 attendance which is down from 1973 of 4,074,000 is felt to be due to the energy crisis and a reduction of visitors and second home owners from the Pittsburgh metropolitan area. Pymatuning is designed for both day and overnight use and offers the following range of activities.

Table 4- 30 Activities and Available Facilities at Pymatuning State Park, 1975

Activities	Facilities
Picnicking	1,000 Tables
Swimming	4,200 Linear Feet of Beach
Fishing	70 Miles of Shoreline
Boating	3,322 Mooring Stations
Hiking	2.0 Trail Miles
Ice Skating	50 Acres (plowed)
Ice Fishing	13,000 Acres
Sledding and Tobogganing	150 Foot Run off the Dam
Hunting	5,000 Acres
Snowmobiling	200 Acres
Camping - Family	828 Sites
Camping - Group	1 Area for 400 People

Source: Pennsylvania Department of Environmental Resources.

Plans for new facilities are primarily maintenance and repair of existing facilities such as boat liveries and maintenance sheds; however, a new marina facility of unknown size is also a possibility.

In the last two years a major drop in the percentage of annual attendance which occurs during the 14.5-week summer season has taken place. In 1972 about 75 percent of the total annual visitors occurred during the summer; but in 1973 and 1974 only 65 percent of the total visitations occurred during the peak summer season. The weekly distribution of visitor days follows closely that of Beltzville with 30 percent of the weekly attendance falling on Sunday, 20 percent on Saturday, and 50 percent falling on the remainder of the week. This distribution was calculated on the 14.5-week summer season which generally runs from Memorial Day to Labor Day. The peak day for the year accounted for about 1.84 percent of the total annual visitor days.

The data in the table below indicates that picnicking, swimming and, recently, boating are the activities that are the most seriously overused for the facilities provided. Excessive turnover rates or crowding are being experienced for these activities.

Table 4-31 Activity, Capacities and Utilization of Selected Activities at Pymatuning State Park, 1972-1974

Activity	Instant Capacity	Peak Day Utilization 1/		
		1972	1973	1974
Picnicking	5,000	40,854	29,585	25,658
Swimming	5,600	10,250	11,500	8,600
Bank Fishing	6,125	9,470	6,924	1,997
Boating	8,000	4,735	23,506	17,670
Camping - Family	3,312	3,732	2,655	3,280
Camping - Group	400	318	246	232

1/ Activity days.

Source: Pennsylvania Department of Environment Resources.

Visitor origins for Pymatuning are indicated by two surveys taken by the Pennsylvania Department of Environmental Resources. The first is a survey of day users taken in 1972 and the other is a camper survey taken in 1971. As might be expected the day users originated much closer to Pymatuning than did the campers. Of the day users, 51 percent live in the two counties (Crawford and Mercer) adjacent to the reservoir, while an additional 16 percent come from neighboring Ohio counties. Allegheny County (Pittsburgh) accounts for 16 percent of Pymatuning's visitors, which reflects to some degree the second home ownership of Pittsburgh residents at Pymatuning. The results of the camper survey indicates a much wider dispersion of visitors. The two counties adjacent to Pymatuning account for only 15 percent of the campers, while the distribution of the distant counties which provide campers to Pymatuning interestingly enough are stretched eastward along the Pennsylvania Turnpike and I-70 and 76; but still approximately 80 percent come from within a 100-mile radius.

IV.C.4.(c) Bear Mountain and Harriman

Bear Mountain and Harriman are individual parks within the Palisades Interstate Park System which is comprised of 17 parks and four historical sites in New York and New Jersey. Bear Mountain and Harriman were selected for analysis because when they are considered together they offer a full range of recreation activities within easy access to the New York City metropolitan population. Bear Mountain has been a favorite park for the outings of New York City residents since its founding in 1900. At that time most of the park's visitors were ferried 25 miles up the Hudson River, and it is still possible to arrive by that means today. In 1974, the Bear Mountain and Harriman parks had over 4,000,000 visitor days which accounted for almost 55 percent of the total attendance in the Palisades park system. Attendance at Bear Mountain and Harriman state parks has stabilized somewhat recently with most of the new growth in attendance occurring at the newer outlying parks of this system.

Even though there are overnight camping facilities available in Harriman, most of the facilities and activities are day use oriented. The range of activities and facilities are shown on the following page.

New facilities planned for the Bear Mountain and Harriman state parks center around Iona Island which is located in the Hudson River. This island will be developed for day use picnickers primarily with major trails and a wildlife refuge as attractions. This development is five to ten years away from becoming operational.

Table 4-32 Activities and Available Facilities at Bear Mountain and Harriman State Parks, 1975

Activities	Facilities
Picnicking	3,176 Tables
Swimming - Pool	43,000 Square Feet of Pool
Swimming - Beach	4,700 Linear Feet of Beach
Fishing	1,900 Acres
Boating	1,120 Acres
Hiking	215 Trail Miles
Ice Skating	15,700 Square Feet of Rink
Ice Fishing	1,250 Acres
Nordic Skiing/Snowshoeing	30,000 Acres
Group Camping	6,845 Sites
Individual Camping	220 Sites
Roller Skating	24,800 Square Feet of Rink
Field Sports	25 Acres

Source: Palisades Interstate Park System.

Since daily attendance figures could not be provided it was not possible to analyze the patterns of weekly, seasonal, or annual visitations. However, from the data that was available and information gained from interviews some evaluation of attendance patterns is possible. The peak summer season runs the normal Memorial Day to Labor Day period; however, there is a mini peak season which occurs during October when the fall foilage attracts numerous sightseers. This mini season is not significant for this purpose because these people are not actively using the recreation facilities of the park, but it does help reduce the peak summer season to about 65 percent of the total annual visitations. The day use activity, as represented by the Bear Mountain attendance, is more evenly distributed throughout the year than the overnight useage, which is represented by the

Harriman attendance figures. The attendance at Bear Mountain would be less evenly distributed were it not for an extensive program of busing inner-city children to the park during the summer weekdays. This even distribution in useage is also helped by the hotel facilities available at Bear Mountain which certainly enhances off-season use.

Distribution of weekly attendance was estimated at 50 percent occurring on Sundays, 25 percent on Saturdays, and 25 percent on the remainder of the week. This attendance distribution estimate indicates that Bear Mountain is convenient for day users to be used on Sunday, while if they have long weekends or vacation time available they will travel further for their recreation. The only activity data available was for camping in the Harriman section of the park. The highest weekly occupancy was 66 percent for the 220 available sites. The fact that camping is not more heavily used, as in the other comparable parks, indicates the area is considered primarily for day use and longer recreation periods are usually spent at facilities farther away.

The total instant capacity for the park is estimated on the basis of available parking facilities and is stated at 20,000 people for the Bear Mountain section and 54,745 people for the Harriman section. In total, the Bear Mountain and Harriman parks have an estimated instant capacity of approximately 75,000. From weekly attendance data the Bear Mountain and Harriman sections of the park are utilized at approximately 30 percent over their estimated capacity on an average summer Sunday. The facilities

receiving the most excessive use are picnic grounds, swimming pools, ice and roller skating facilities and the cafeteria.

New York City contributes approximately 60 percent of total Palisades Park System attendance. The remaining 39 percent is almost equally divided between neighboring New York State and New Jersey counties. Harriman and Bear Mountain State Parks each comprise 40 percent of total Palisades Park System attendance. Automobiles are the dominant access mode accounting for 89 percent of total park visits.

IV.C.4.(d) Kinzua Dam

The Kinzua Dam is a Corps of Engineers project completed in 1966 which created the Allegheny Reservoir in the Allegheny National Forest. This recreation area is managed by the U.S. Forest Service and is located on the New York/Pennsylvania border about 75 miles east of Erie, Pennsylvania. The Allegheny National Forest contains some 499,000 acres of land area; however, only 14,176 acres surrounding the reservoir are developed for recreation. The reservoir itself contains 12,050 acres of water, for a total of over 26,200 acres of recreation area. Total visitor day use for the entire Allegheny National Forest exceeded 1,926,000 visitors in 1972. The Allegheny Reservoir portion accounted for approximately 40 percent of that total or about 770,000 visitor days. This attendance is up significantly from the 126,500 visitor days which occurred in 1967 which was the first full year of operation. Visitor days have been projected by the National Forest Service Management Plan to reach 5,000,000 for the reservoir portion by 2000.

The Allegheny Reservoir and National Forest offers a wide range of outdoor recreation activities. These activities, the 1972 total visitor days and the instant capacities for the reservoir are shown in the table below.

Table 4-33 Activities and Annual Utilization of the Allegheny National Forest

Activity	1972 Visitor Days 1/ Number	Percent	Instant Capacities 1974	2000
Picnicking	48,100	2.5%	3,420	4,500
Swimming	18,800	1.0	4,565	11,300
Fishing	213,800	11.1	6,900	6,900
Boating	166,800	8.7	3,985	6,300
Hiking	51,300	2.7	2,400	2,400
Camping	432,000	22.4	4,045	9,350
Snowmobiling	57,500	3.0	3/	3/
Hunting	221,300	11.5	4,770	4,770
Winter Sports	2,300	0.1	750	750
Sightseeing	573,100	29.7	10,000	10,000
Other 2/	141,600	7.3	1,130	1,130
TOTAL	1,926,000	100.0%		

1/ Not comparable with definition in other tables.

2/ Includes motorcycle and 4-wheel drive, team sports and games, recreation residents and others.

3/ Capacities not given.

Source: Allegheny National Forect Management Plan.

Because of a different definition of "visitor day" used by the administrating agency, this data is not comparable to other data in this chapter. Nevertheless, the relative importance of camping versus swimming is interesting when compared to parks with smaller acreages and closer to urban populations.

It was estimated by Forest Service officials that while their summer season ran from Memorial Day to Labor Day, the months of July and August accounted for fully 70 percent of the total annual attendance. The distribution of attendance during the typical summer week is estimated to be 50 percent on Friday, Saturday and Sunday, and the remaining 50 percent during the other days of the week.

Based upon a visitors survey conducted in 1972 about three-quarters of the Allegheny Reservoir users were from Pennsylvania, with New York and Ohio each accounting for about ten percent. Of those surveyed, about 45 to 50 percent lived within a 30-mile radius of the reservoir.

IV.C.4.(e) Relation to Tocks Island

Based on the above analysis of comparable recreation areas, some observations become apparent, particularly in regard to the formulas used to predict visitation at DWGNRA. The peak season should be considered to be from Memorial Day to Labor Day which is an average of 14.5 weeks long. The amount of visitation which takes place out-of-season varies greatly by activity. For instance, 100 percent of the swimming occurs during the 14.5 weeks, so the greater the proportion of swimming in the park, the greater the share of total visitation will occur in the defined season.

Given the location of Tocks Island with relation to large urban population centers and the activities anticipated at Tocks Island, the weekly distribution of attendance might approximate 30 percent or more on Sunday,

20 percent on Saturday, and less than 50 percent during the remainder of the week. This distribution of visitation will occur after a startup period has elapsed and the public becomes aware of and adjusts to its peak periods and capacities. It should not be unreasonable to expect a similar experience to what has occurred at Beltzville to occur at Tocks Island.

The information contained in the various visitor surveys would suggest that a much larger share of the activity days will come from a rather local population than has sometimes been suggested. Without doubt, much of the weekend use will be from New York City and Philadelphia metropolitan residents; however, "inflow" from outside the defined service area will likely be minimal as a percentage of total visitation.

One statistical area which seems to vary considerably from the assumptions which have been used in the past is the percent of total visitation who are sightseers motoring through without using any recreation facilities. Compared to the 20 percent of total visitation uniformly used, Beltzville had about 40 percent sightseers, Pymatuning over 50 percent (inflated by through public roads in the area) and Allegheny National Forest 30 percent.

IV.C.5. OUTDOOR RECREATION DEMAND IN THE SERVICE AREA

IV.C.5.(a) Forecast Participation in Outdoor Recreation

The methodology for forecasting participation rates and activity days within the recreation service area was described in IV.C.2. above. This

co plex process was done by computer by Ide Associates, Inc. and produced printouts of county-by-county demographic forecasts and participation in 14 different outdoor recreation categories. The future participation rates reflect not only the population growth forecast (under the three forecast levels) but also changes in age and income distributions of the population and current patterns of car ownership and race among the counties of the recreation service area.

Table 4-34 below summarizes the total demand in seven major recreation categories for the recreation service area and its component state totals. Demand is expressed in terms of activity days in the indicated year for the medium level of economic growth discussed in Chapter I. Comparable figures for other forecast years and for the high and low growth levels are presented in the appendix tables of this chapter.

The nature of the data available does not permit the demand to be broken down into various subcategories such as canoeing versus motorboating or beach versus pool swimming. However, some indication of subcategory demand can be obtained from the 1972 National Recreation Survey which indicates that in the Northeast Region of the country canoeing and waterskiing each represent 15 percent of the boating activity, sailing is 30 percent and other boating, 40 percent. The same survey indicates that 30 percent of outdoor swimming activity is in pools with the remainder in rivers, lakes and at various beaches.

Table 4-34 Activity Days Demand in the Tocks Island Lake Recreation Service Area, 1974-2025, Medium Growth Level

	Swimming	Picnicking	Boating	Fishing	Hunting	Hiking	Camping
1974							
Pennsylvania	168,723	40,815	22,208	29,955	14,157	48,827	18,150
New Jersey	169,232	38,799	22,753	28,642	13,337	45,948	17,427
New York	322,788	76,072	43,501	52,468	25,260	89,341	31,511
Connecticut	43,000	9,665	5,815	7,286	3,442	11,638	4,437
Delaware	9,899	2,335	1,310	1,720	770	2,683	1,058
Service Area	713,642	167,686	95,587	120,071	56,966	198,437	72,583
1985							
Pennsylvania	194,322	43,970	26,564	32,154	15,198	52,374	19,375
New Jersey	208,903	45,173	29,312	33,247	15,482	53,247	20,132
New York	357,333	79,193	49,951	54,471	26,217	92,533	32,566
Connecticut	49,671	10,570	7,011	7,927	3,746	12,662	4,803
Delaware	12,072	2,683	1,668	1,963	878	3,061	1,200
Service Area	822,301	181,589	114,506	129,762	61,522	213,878	78,076
2025							
Pennsylvania	268,119	51,419	39,767	39,324	18,669	63,904	23,633
New Jersey	311,168	59,315	46,670	45,544	21,256	72,789	27,498
New York	466,621	89,400	69,647	64,709	31,099	108.978	38,609
Connecticut	71,806	13,565	10,808	10,605	5,017	16,949	6,395
Delaware	19,784	3,838	2,951	2,924	1,308	4,560	1,778
Service Area	1,137,498	217,537	169,843	163,106	77,349	267,180	97,913

Note: Activity days in thousands.

Table 4-35 summarizes the total activity days of demand in the recreation service area for the three alternative growth levels. This again is a summary of more detailed information presented in the appendix tables. While the difference in demand in a future year among the three growth levels does not appear to be great, the difference in the change between the current demand and the future demand is quite significant. For example, the increase in swimming demand between 1974 and 1985 is about 55,000,000 activity days under the low growth option compared to more than 131,000,000 activity days under the high growth projections, a factor of more than twice the numerical increase. Similar differences in increments of demand are observed in the other recreation categories as well.

Table 4-35 Annual Activity Days by Service Area Residents in Seven Major Recreation Categories

	Economic Growth Level		
	Low	Medium	High
1974			
Swimming	-	713,642	-
Picnicking	-	167,686	-
Boating	-	95,587	-
Fishing	-	120,071	-
Hunting	-	56,966	-
Hiking	-	198,437	-
Camping	-	72,583	-
1985			
Swimming	788,244	822,301	844,718
Picnicking	174,179	181,589	186,519
Boating	109,749	114,506	117,628
Fishing	124,151	129,762	133,410
Hunting	58,867	61,522	63,244
Hiking	204,990	213,878	219,744
Camping	74,664	78,076	80,285
2025			
Swimming	1,015,259	1,137,498	1,275,050
Picnicking	194,185	217,537	243,833
Boating	151,536	169,843	190,419
Fishing	144,502	163,106	183,259
Hunting	68,515	77,349	86,916
Hiking	237,909	267,180	299,688
Camping	86,615	97,413	110,074

Note: Activity days in thousands.

IV.C.5.(b) Overnight Versus Day-Trip Demand

The table below shows the distribution of activity days by type of visit and the time involved; it is shown as a step in calculating the overnight versus day-trip demand. The information is national data based on the 1972 NRS and combined with the at-home component determined by the Ide Associates survey. Although this is the best data available, the NRS data applies to summer activities only so the vacation component may be overstated.

Table 4-36 Distribution of Activity Days by Type of Visit

	Percent of Activity Days				
	Vacation 1/	Trip 2/	Outing 3/	Home 4/	Total
Swimming	13.9%	6.5%	25.5%	54.1%	100.0%
Picnicking	19.2%	10.6%	49.0%	21.2%	100.0%
Boating	25.0%	21.0%	36.5%	17.5%	100.0%
Fishing	20.4%	13.6%	35.6%	30.4%	100.0%
Hiking	24.7%	13.7%	23.0%	38.6%	100.0%
Camping	63.9%	36.1%	-	-	100.0%

Note: Hunting data not available in this format.

1/ Away from home overnight for two nights or more.

2/ Away from home overnight for one night only.

3/ Away from home but not overnight.

4/ Within 15 minutes of home and not overnight.

Source: Calculated from data in the National Recreation Survey, Bureau of Outdoor Recreation and Ide Associates survey.

Based upon the above distributions of activity by type of trip, estimates have been made of the total overnight demand and day trips. The calculation assumes that the trip consists of one overnight for each two activity days and vacations average seven activity days and six nights. The exception to this is camping which is assumed to be in terms of "activity nights" in the first place. The split between nights and day trips within the recreation service area is shown in the table on the following page. It can be observed that the activities having the greatest proportion of overnight demand are boating, hiking and, by definition, camping; but the greatest single generator of overnight facilities demand is still swimming. Because of the assumptions, the activities shown in Table 4-37 will sum to less than the total activity days previously forecast.

IV.C.5.(c) Possible Shifts in Activity Patterns

The forecasts presented in the tables above are based on current participation factors modified by demographic differences within the service area now and over time. They do not and cannot account for the many unknowns of future consumption patterns, except for the fact that some account for a new energy situation reflected in the use of a 1974 survey. This survey also gives some insights as to what changes in activity the participants themselves would envision if more facilities were available to them.

While "What would you do if . . ." questions are of less value in interpreting public surveys than hard data, two questions in particular from

Table 4-37 Overnight and Day Trip Demand by Activity, Medium Economic Growth Level

	Night	Day-Trips	Home
1974			
Swimming	108,205	181,979	386,000
Picnicking	36,479	82,166	35,549
Boating	30,516	34,889	16,727
Fishing	29,157	42,745	36,502
Hunting 1/	11,963	17,944	21,077
Hiking	55,598	45,641	76,597
Camping	52,849	-	-
1985			
Swimming	124,680	209,689	444,865
Picnicking	39,504	88,979	38,497
Boating	36,556	41,795	20,039
Fishing	31,510	46,195	39,448
Hunting 1/	12,920	13,379	22,763
Hiking	59,924	49,192	82,557
Camping	56,849	-	-
2025			
Swimming	172,471	290,062	615,386
Picnicking	47,324	106,593	46,118
Boating	54,222	61,993	29,723
Fishing	39,607	58,066	49,584
Hunting 1/	16,243	24,365	28,619
Hiking	74,858	61,451	103,131
Camping	71,293	-	-

Note: Thousands of nights or day visits.

1/ Hunting away from home was assumed to be 50 percent Outing and 50 percent Vacation and Trips and the latter average was 3 days and 2 nights in length.

the Ide Associates survey provide some valuable background. The first asked whether the participant was inconvenienced or bothered by overcrowding the last time he or she participated in each activity. The highest "yes" response to this question was for such fixed-capacity facilities as tennis, golf and skiing; and among the major categories discussed in this section, only swimming had an above average number of "yes" responses to this question.

The second question asked whether a person would participate in a given activity more if the facility were closer or more convenient. The intent was to measure the extent to which distance was a constraint on participation. The percentages shown below are the percent of the present activity days in each category accounted for by people who felt they would participate more frequently if the facility (of their last visit) were only half as far from home. Note that this does not indicate a potential percentage increase in participation but rather a relative (by activity) measure of resistance to distance.

Swimming	19.8%
Picnicking	27.6%
Boating	36.3%
Fishing	27.1%
Hunting	15.7%
Hiking	18.0%
Camping	31.4%

These two questions indicate a possible conservative bias in extending present participation rates into the future where new major increments of supply are to be added significantly closer to the population centers. It

could be said, however, that Tocks Island Lake is not significantly closer to the population centers than the beaches or many of Pennsylvania and New York's state parks.

Another factor influencing future demand patterns is attempts at "outreach" on a large scale. The demographic section above noted the wide disparity in participation rates among demographic groups. While differences due to age or education may be understandable consumer choices, those due to race, income and car ownership can logically be traced to lack of mobility and opportunity. Any concentrated effort to change these factors or design special programs to reach these markets can increase the overall demand indicated in the above tables.

However, since any such special efforts by one facility (Tocks Island) would be miniscule in the total demand framework, it would be more appropriate to deal with this as an increment to a "base-line" projection of DWGNRA attendance than to modify the regional demand estimates.

IV.D. FUTURE OUTDOOR RECREATION NEEDS

Future demand for recreation can be and has been forecast and supply can be measured to the extent data is available -- as was done in Section IV.B. The classic approach would be to say the difference is the need; but it is not that simple. First of all some consistent measure is needed for comparison; the consultants have chosen the daily capacity for this measure. Secondly, the supply and responsibility for providing supply is so dispersed that supply measures do not cover all the areas that people use; for example, much of the picnicking activity (demand) undoubtedly takes place on beaches, woods, fields -- not on a picnic table (supply).

In this section, the demand forecasts are converted into daily capacity requirements which are then compared with the available capacities developed in IV.B. above, in order to estimate the future need for facilities which might be met by the Delaware Water Gap National Recreation Area.

IV.D.1. RECREATION DEMAND FORMULAS

As noted earlier, utilization of one single demand formula for estimating the design load of a recreation project ignores some important variations inherent in various outdoor recreation activities. The percent of activity that occurs within the normal season and the share of the weekly

attendance that occurs on Sunday are two major variables. For purposes of this analysis turnover is not considered in order to deal strictly in a daily capacity. Daily capacity when divided by turnover will yield the instant capacity or design load.

There is an obvious trade-off when defining a given recreation activity season. To illustrate, it could be said that the "normal season" is one week long and five percent of the annual activity occurs in that period, or the "normal season" is 51 weeks long and accounts for 95 percent of the annual activity. The requirement for defining a "normal season" should be consistent with the character of most of the activities being considered and be of short enough duration to yield a reasonable weekly average. Based on empirical attendance data from the Pennsylvania Department of Environmental Resources, it is necessary to change the length of the "normal season" only slightly. It is the opinion of the consultants that the normal season runs from, and includes, Memorial Day to Labor Day, which is a period of 101 to 102 days depending on the year. This is an average of 14.5 weeks as opposed to the previously used 14 weeks.

Having pegged the normal season to all activities (except hunting), the variation appears in the percent of the annual activity that occurs in season. If hunting had been included in that 14.5-week season only one or two percent of the annual activity would have occurred in season and any estimates of supply requirements would have been meaningless. To correct for this anomaly, the hunting season was estimated to occur for a

ten-week period beginning about mid-October and running through mid-December. There will be some variation in the exact timing because the opening day of hunting season may vary by as much as two or three weeks.

Major changes in estimates of the percent of weekly activity that occurs on Sunday have been made, again based on analysis of attendance data at Pennsylvania state parks. As previously described, the original studies used 60 percent of weekly attendance as the Sunday average; and this was reduced to a range of 26 to 29 percent in subsequent analyses. The consultant's estimates range from a high of 35 percent for picnicking to a low of 25 percent for hiking and camping. Hunting actually had a higher peak day estimate, 40 percent, but hunting has its own season and the peak hunting day is Saturday.

Based on a detailed analysis of daily, weekly and seasonal attendance data from several Pennsylvania state parks over a three-year period, the consultants have developed new daily capacity formulas for each activity. The table below displays the major components of the revised formula by activity.

Table 4-38 Recommended Seasonal and Daily Variation by Activity to be Used in Design Equations

	Weeks in Season 1/	Percent of Annual Activity Within Season	Percent of Weekly Activity On Sunday	Percent of Annual Activity On Sunday
Swimming	14.5	100%	33.3%	2.3%
Picnicking	14.5	90%	35.0%	2.2%
Boating	14.5	70%	33.3%	1.6%
Fishing	14.5	55%	27.5%	1.0%
Hunting	10.0	95%	40.0% 2/	3.8% 2/
Hiking	14.5	60%	25.0%	1.0%
Camping	14.5	90%	25.0%	1.6%

1/ Season from Memorial Day to Labor Day, except for hunting which is Mid-October to Mid-December.

2/ Saturday for hunting.

As an example, the formula for swimming daily capacity, based on the information in the above table, would look like this:

$$\text{Swimming Daily Capacity} = \frac{\text{Annual Visitation} \times 1.0 \times .333}{14.5}$$

In order to estimate the design load or instant capacity, a step not relevant at this point in the analysis, the facility turnover must be factored into the denominator of the equation.

IV.D.2. REQUIRED DAILY CAPACITIES

The seasonal and weekly factors described above are used in combination with the forecast annual activity days to calculate the daily capacity needed to satisfy the demand, but not before making two significant adjustments which are described below. Table 4-39 summarizes this calculation. These adjustments are based upon the fact that there are certain differences in the concepts which define the demand and supply measures so certain adjustments are necessary to bring both to the same terms for comparison. One of these differences is the type of place in which the activity takes place. The supply data covers most public facilities and most private and semi-public areas where the public has access whether through fees, membership or sponsorship by an organization (such as in Y camps). The participation data, on the other hand, is derived without regard to where it takes place, and much of it takes place at home, at a neighbor's home, on other private individuals' land (particularly important to hunting), at apartment project recreation facilities and similar facilities not included in the supply inventory. This component of use must be factored out of the "demand" before calculating the supply requirements for comparison with current supply. The adjustments made and shown in Table 4-39 are based on responses to the Ide Associates survey regarding the type of place each activity was engaged in.

A second adjustment was made in the boating category to address a deficiency in the supply inventory relating to the inability to tabulate the unlimited resources for saltwater boating. Based on New York State

boat registrations, the consultant has estimated that boating demand in New York is approximately 30 percent freshwater and 70 percent saltwater. Extrapolating from this data it is estimated that Pennsylvania demand is 80 percent freshwater, New Jersey, 20 percent, and Delaware and Connecticut, 10 percent. The weighted average for the service area indicates 38 percent of the boating demand is for freshwater boating. So an additional adjustment (reduction) in demand of this amount has been made for the boating category.

The adjusted demand in terms of activity days shown in the second column of Table 4-39 has been converted to needed daily capacity using the factors for seasonal and daily attendance variations described in Table 4-38; this can be compared with the available daily capacity tabulated in Table 4-19 and reshown in the final column of Table 4-39.

It is obvious from the comparison of current supply and current needs that there are some severe deficiencies; some of these are methodological and some some are true reflections of present deficiencies. The supply inventory is admittedly less complete at the municipal level than for state and federal facilities and the differing attention to detail given by the SCS among counties for the private supply has been noted. Nevertheless, even the most detailed field survey could not account for picnics not at a table, or hiking and camping completely off the beaten, and inventoried, path. In addition, it is likely that some of the demand, particularly swimming, hunting and camping, is satisfied outside of the recreation service area. Observations on the needs for individual activity facilities are made below.

IV.D.2. REQUIRED DAILY CAPACITIES

The seasonal and weekly factors described above are used in combination with the forecast annual activity days to calculate the daily capacity needed to satisfy the demand, but not before making two significant adjustments which are described below. Table 4-39 summarizes this calculation. These adjustments are based upon the fact that there are certain differences in the concepts which define the demand and supply measures so certain adjustments are necessary to bring both to the same terms for comparison. One of these differences is the type of place in which the activity takes place. The supply data covers most public facilities and most private and semi-public areas where the public has access whether through fees, membership or sponsorship by an organization (such as in Y camps). The participation data, on the other hand, is derived without regard to where it takes place, and much of it takes place at home, at a neighbor's home, on other private individuals' land (particularly important to hunting), at apartment project recreation facilities and similar facilities not included in the supply inventory. This component of use must be factored out of the "demand" before calculating the supply requirements for comparison with current supply. The adjustments made and shown in Table 4-39 are based on responses to the Ide Associates survey regarding the type of place each activity was engaged in.

A second adjustment was made in the boating category to address a deficiency in he supply inventory relating to the inability to tabulate the unlimited resources for saltwater boating. Based on New York State

boat registrations, the consultant has estimated that boating demand in New York is approximately 30 percent freshwater and 70 percent saltwater. Extrapolating from this data it is estimated that Pennsylvania demand is 80 percent freshwater, New Jersey, 20 percent, and Delaware and Connecticut, 10 percent. The weighted average for the service area indicates 38 percent of the boating demand is for freshwater boating. So an additional adjustment (reduction) in demand of this amount has been made for the boating category.

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Table 4-39 Current Daily Capacity Needs and Available Supply in the Recreation Service Area

	Activity Days (000)		Daily Capacity (000)	
	Total 1/	Adjusted 2/	Needed 3/	Available 4/
Swimming				
Pennsylvania	168,723	94,485	2,173	2,013
New Jersey	169,232	94,770	2,180	1,076
New York	322,788	180,761	4,158	1,464
Total RSA	713,642	399,640	9,192	4,912
Picnicking				
Pennsylvania	40,815	28,979	638	474
New Jersey	38,799	27,547	606	71
New York	76,072	54,011	1,188	372
Total RSA	167,686	119,057	2,619	925
Boating				
Pennsylvania	22,208	14,924	239	160
New Jersey	22,753	3,822	61	60
New York	43,501	10,962	175	321
Total RSA	95,587	30,511	488	567
Fishing				
Pennsylvania	29,955	22,167	222	240
New Jersey	28,642	21,195	212	90
New York	52,468	38,826	388	482
Total RSA	120,071	88,852	889	851
Camping				
Pennsylvania	18,150	13,431	215	118
New Jersey	17,427	12,896	206	38
New York	31,511	23,318	373	101
Total RSA	72,583	53,711	859	260

Note: Connecticut and Delaware included in recreation service area (RSA) totals.

1/ From Table 4-34.

2/ Adjusted for type of facility and salt-water boating.

3/ From factors in Table 4-38.

4/ From Table 4-19.

IV.D.2.(a) Swimming

Taking the recreation service area as a whole, swimming facilities appear to be inadequate to meet current needs. This is apparent from the severe overcrowding experienced at the beaches and major swimming areas closest to the urban population centers (such as at Bear Mountain in New York). It can be noted in Table 4-39 that the greatest shortages are in the New York and New Jersey portions of the service area while Pennsylvania, with its numerous lakes and well developed state park system shows an adequate current supply. This does not, of course, mean that the supply in Pennsylvania is distributed in the optimum manner since much of the available supply is in remote mountainous settings far from the urbanized areas. Even if it is assumed that the south Jersey beaches outside of the service area serves only service area residents with its daily capacity of 1,128,000 swimmers, there is still an indicated deficiency in capacity of about 3,000,000 swimmers on the average summer Sunday.

IV.D.2.(b) Boating and Fishing

When adjusted for the fresh/saltwater split in demand, a moderate surplus of boating facilities is indicated by Table 4-39, but only by considering the full, and currently unused, capacity of the Hudson and Delaware rivers; if these are not considered, there is a shortfall of approximately 80,000 in capacity. The consultants' observations concerning boating demand in the recreation service area is that due to horsepower limitations on most lakes and the rapid deterioration of the quality of the boating experience with overcrowding, there is a great demand for more boating space. In both boating and fishing, New York is relatively better off than the other two major states in the service area.

IV.D.2.(c) Picnicking and Camping

Facilities for these two activities show up in the table as being grossly deficient; but in these categories there are special considerations which make the deficiency not as great as it would appear. There is no way in the demand data to determine the share of picnicking which takes place on a beach, in the field or out in the woods and not at a picnic table -- the only supply measure included in this category. Since picnicking is often carried on in conjunction with other recreation activities, particularly swimming and boating, the true current deficiency might be considered comparable to that of swimming and boating where a significant increase in the available capacity would be called for to meet current demand.

The camper, likewise, has considerable flexibility in choosing his location -- more so for the primitive camper than the family with a motorized camper/trailer. Nevertheless, there appears to be a true deficiency of camping facilities in the region. Private campgrounds operate at capacity in season and Pennsylvania even resorts to a lottery to select among applicants for the available cabins in the state parks and forests.

Allowing for some outflow of camping activity from the region and considering the primitive camping component, it can be generally concluded that 50 percent additional camping capacity would be needed to satisfy the current demand, or about 130,000 daily capacity.

IV.D.2.(d) Hunting and Hiking

Hunting and hiking demand has been forecast for the recreation service area but these activities are not shown in Table 4-39 because they are not susceptible to the same direct comparisons with supply. There are some differences in definitions and approach which are not reconcilable within the available data. Hunting demand, for example, includes sports shooting done at target ranges and gun clubs which are not included in the supply inventory. Furthermore, there is no way to separate areas of, for example, deer hunting from quail hunting -- with their widely divergent capacities in terms of hunters per acre. According to the Ide Associates survey, over 40 percent of the hunting is done on private property. Likewise with hiking, the "official" marked trails constitute such a small portion of all hiking activity that demand/supply comparisons would be misleading. The number in this analysis would suggest that capacity for additional 500,000 hikers (including both wilderness and nature trails) would be required to accommodate all of the current demand on developed and maintained trails.

To a great extent, however, facilities for hiking, picnicking, camping and hunting can be added at minimal extra cost within large parks and the deficiencies in these categories are not as relevant to evaluating DWGNRA and alternative recreation solutions as are swimming and boating which are highly oriented to developed facilities.

IV.D.3. FUTURE CAPACITY REQUIREMENTS

The final table in this chapter indicates the needed additions to daily capacity in order to satisfy the service area's recreation outdoor demand as previously indicated in Table 4-35. The total activity days were adjusted to account for the type of location where the activity will occur and for the fresh/saltwater split in boating demand in the same manner as previously described. The future supply needs are far in excess of anything contemplated by existing plans within the recreation service area. For example, the programmed future supply (not counting DWGNRA itself) described in Section IV.B. provide daily capacity for an additional 41,500 swimmers, 14,900 picnickers, 23,100 boaters and 11,100 campers. While these seem to satisfy much of the growth in demand between 1973 and 1985, they do not begin to address present deficiencies which are generally estimated to be 3,000,000 swimmers, 300,000 picnickers (at tables), 130,000 campers, and as much as 80,000 boaters depending on the use that can be made of the Hudson and Delaware rivers.

As indicated in Table 4-40, the forecast increases in need in the short run are small in relation to the estimated current deficiencies although the additional needs between 1985 and 2025 are substantial. For example, daily swimming capacity will need to be increased by 1,300,000 or 3,600,000 (depending on the growth level achieved) just to meet the growth in demand to say nothing of correcting current deficiencies. There is a wide range in needs associated with the three regional economic growth levels

described in Chapter I, but it is more than just a difference in the total population level which influences recreation demand. Most significant is the distribution of the population growth. The low growth alternative visualizes a much greater concentration of people within the urbanized areas and the central cities, while the high growth option calls for some thinning out of population to present rural and ex-urban regions. The low level, then, would intensify the need for "urban relief" recreation, while the high would place more people closer to rural recreation facilities such as DWGNRA.

Table 4-40 Future Daily Capacity Needed to Satisfy Service Area Outdoor Recreation Demand

	Economic Growth Level		
	Low	Medium	High
Total Needed Capacity			
1985:			
Swimming	10,152	10,591	10,880
Picnicking	2,720	2,836	2,912
Boating	589	615	632
Fishing	919	960	987
Camping	884	924	950
2025:			
Swimming	13,076	14,650	16,422
Picnicking	3,033	3,398	3,809
Boating	814	913	1,024
Fishing	1,069	1,207	1,356
Camping	1,025	1,159	1,303
Change in Needed Capacity			
1974 - 1985:			
Swimming	960	1,399	1,688
Picnicking	101	217	293
Boating	101	127	144
Fishing	30	71	98
Camping	25	65	91
1985 - 2025:			
Swimming	2,924	4,059	5,542
Picnicking	313	562	897
Boating	225	298	392
Fishing	150	247	369
Camping	141	235	353

Note: Daily capacity in thousands of visitors.

IV.D.4 CHARACTERISTICS OF FUTURE RECREATION NEED

It is difficult to draw hard and fast conclusions concerning future recreation need because of the uncertainties underlying the statistical analysis and the vagaries of management, attractiveness and location of any given facility which influence the extent to which it will be patronized and can meet the need. There are also philosophical questions concerning how much of the need the public should supply. Crowded facilities and traffic jams attract a lot of attention in peak periods; but this is not necessarily justification for expanding facilities, so that everyone is comfortable on a hot 4th of July, that at most other times would be underutilized. Any prudent analysis of public investment would suggest building for an average summer Sunday (as is implied in the capacity calculations used in this chapter) which means that even if the need were adequately met there would still be occasional periods of overcrowding.

Some conclusions are possible, however, when the numerical measures of need are combined with the consultants' field observations and other background analyses presented in this chapter.

1. There is a substantial shortage of facilities compared with demand particularly in the more urbanized areas of New Jersey and New York. Crowding at existing facilities bears an almost direct relationship to proximity to major population concentrations.

2. There is a growing awareness among the public of alternatives to crowded beaches and mass attendance facilities. Though still small in absolute terms, those who appreciate hiking, wilderness camping and more pastoral activity are much more sensitive to the deterioration of the quality of the experience that comes with overuse than are swimmers and picnickers. The land requirements per visitor for such activities are orders of magnitude larger than more intense experiences and the land resources of the region may not be capable of handling the demand if such activities continue to gain in popularity.

3. The majority of the recreating population are still willing to tolerate crowds (or they wouldn't be there) and, in fact, some academic literature has suggested that the urban recreationist actually prefers to be around people and really wants to pursue common activities (such as swimming, picnicking, playing games and having conversation) in a natural setting rather than to have a completely foreign experience. Therefore, no level or pattern of facility construction will automatically distribute the crowds evenly; there will be places that will continue to be "in" in spite of, or perhaps because of, congestion.

4. Swimming is the most popular outdoor recreation activity and the one with the greatest numerical shortage in terms of daily capacity. Furthermore, the gaps shown in the analysis only reflect current and forecasted patterns of participation; any deliberate placing of supply in order to increase participation of minorities, the autoless and the poor (as described in IV.C.3) could require millions of spaces more in daily capacity.

5. Freshwater boating is severely restricted by the size of existing facilities, and horsepower limitations and water quality; in many situations boating and swimming activities conflict to the detriment of the quality of the experience of both. As an indication of the lack of freshwater boating opportunities, the 1972 National Recreation Survey indicates that the south region of the United States, where there are many large lakes, experiences participation in waterskiing 50 percent greater than does the northeast region while swimming participation in the south is actually less.

6. While the "quality of the experience" would seem to be greater in more natural, less crowded conditions, the state forests and undeveloped park areas within the service area are underutilized, certainly well below their capacities.

As a final point in discussing future recreation needs it should be noted that large segments of the population are currently deprived of suitable recreation experiences. Some of this is due to the lack of quality in the experience caused by overcrowding but even more is due to the demographic differences in participation described in IV.C.3. This major component of deprivation stems more from the lack of mobility than the unavailability of recreation opportunities per se. This problem is properly addressed through programmatic means in the short run and through technological means (mass transit) in the future, and in either case can be accommodated to a great extent by more efficient off-peak utilization of these existing facilities. This is to say that a deficiency of outdoor recreation facilities is only one aspect of the total recreation issue and the construction of a statistically adequate supply in the future would not in itself assure that all of the recreation needs of the region were being met.

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APPENDIX TO CHAPTER IV

RECREATION DEMAND FORECAST TABLES

TABLE 4.A.1 ---ESTIMATED COUNTY GROUP POPULATION, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY CAR OWNERSHIP AND FAMILY INCOME, 1974

STATE AND COUNTY GROUP	TOTAL POPU-LATION	TOTAL 5 AND OVER	CAR OWNING HOUSEHOLD	NO CAR	UNDER $4,000	$4,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 -24,999	$25,000 AND OVER
TOTAL SERVICE AREA	29730000	27482269	23211322	4270947	719352	1477634	2263957	6053041	10513434	6454851
PA TOTAL	7248200	6712180	5855794	856386	169438	418550	663463	1706133	2590368	1004220
PA BERKS	306600	285750	256418	29332	4692	14434	22712	81620	125539	36753
PA BRADFORD	59600	54355	50999	3356	2197	5013	8001	16582	18664	3890
PA BUCKS	447700	409198	396325	12873	4387	11841	17487	84229	198545	92700
PA CARBON	52100	48454	43437	5017	1002	5024	8860	16933	14893	1742
PA CENTRE	104200	96282	90200	6082	2733	7517	12271	29289	30457	16015
PA CHESTER	291700	269530	255770	13760	3376	8907	13207	57186	108449	70403
PA CLINTON	38500	35728	33171	2557	796	3493	6010	12901	10005	1763
PA COLUMBIA	57800	53697	49453	4244	1005	5462	9755	18538	16501	2636
PA HARRISBURG SMSA	429500	398577	363438	35139	6502	22582	37062	116364	156535	59530
PA LACKAWANNA	237200	221782	193290	28492	4463	19978	34932	71739	71712	18950
PA LANCASTER	336000	309120	281259	27861	5223	17495	28619	91218	128071	38494
PA LEBANON	104500	96559	89351	7208	995	5732	9780	32578	38930	8544
PA LEHIGH & NORTHAMPTON	484100	450698	411379	39319	11467	37317	62435	137051	163460	98968
PA LUZERNE	346800	324606	279317	45289	10278	30189	50422	104612	104723	24302
PA LYCOMING	115900	106976	97687	9289	2587	8290	13702	35758	38313	8326
PA MONROE	50400	46923	43972	2951	2538	6341	10448	16354	11245	9
PA MONTGOMERY	633400	587981	556595	31386	5531	14344	21074	100847	246717	199468
PA MONTOUR	17900	16754	15062	1692	595	1613	2664	5316	5244	1322
PA NORTHUMBERLAND	100500	93566	85304	8262	3527	11195	19409	30089	26451	2895
PA PHILADELPHIA & DELAWARE	2414200	2233135	1739635	493500	83996	146408	216259	572246	651031	362395
PA PIKE	13300	12435	11734	701	302	1170	1865	3637	4012	1229
PA SCHUYLKILL	161900	150729	131002	19727	1534	5931	10029	27600	60597	45038
PA SNYDER	31500	29074	27411	1663	773	2674	4556	9764	9457	1858
PA SULLIVAN	6000	5562	5291	271	407	717	1135	1229	1682	392
PA SUSQUEHANNA	37200	34113	31447	2666	1361	3492	5761	10410	10905	2204
PA UNION	29800	27714	26187	1527	412	2527	4957	8096	9354	2768
PA WAYNE	33000	30624	28369	2255	1266	3511	5986	8918	8800	2143
PA WYOMING	21200	19313	18183	1130	723	2035	3409	5823	6441	882
PA YORK	285500	262945	243906	19037	4570	13358	21056	79202	112035	32724
NJ TOTAL	6649200	6311221	5647397	663824	121046	259154	390257	1279806	2599973	1660985
NJ BERGEN	906600	845857	795791	50066	9419	18570	26682	116335	354525	320326
NJ ESSEX	858800	790955	631000	159955	28146	68187	71343	170490	276539	196250
NJ HUDSON	618400	574339	416068	158271	16217	38402	60717	154861	215868	88294
NJ HUNTERDON	76460	70441	67370	3071	988	2540	3830	15174	30426	17683
NJ MERCER	320600	296554	265718	30836	5189	13122	20508	63854	123234	70647
NJ MIDDLESEX	604900	555920	523810	32110	7718	13760	17959	105783	270692	140000
NJ MONMOUTH	480900	446487	416858	29629	7912	18780	29136	88471	175558	126622
NJ MORRIS	399900	361910	349681	12229	2918	6214	8136	48725	160776	135141
NJ OCEAN	262500	241500	227271	14229	6554	18234	30170	64964	88070	33508
NJ PASSAIC	471900	434148	374107	55041	9458	20658	31575	100375	179705	92377
NJ PHILADELPHIA SMSA-NJ	899900	825208	767006	58202	13946	33895	51136	190424	394045	181762
NJ SALEM	63900	58852	55096	3756	1495	3024	4471	15735	24227	7900
NJ SOMERSET	204400	188641	181215	7446	2117	3561	4574	25696	84609	60044
NJ SUSSEX	43200	39226	37771	1455	579	1525	2277	10063	16957	7825
NJ UNION	546700	509523	467166	42357	6831	15132	22444	88501	211635	164900
NJ WARREN	77700	71640	66469	5171	1559	3542	5299	20275	31067	9898
NY TOTAL	13525100	12511864	9915164	2596700	395957	731646	1110248	2594440	4509466	3168107
NY ALBANY SMSA	747300	689012	604215	84797	13062	33463	52356	170729	286114	133288
NY BROOME & TIOGA	266700	244831	222307	22524	6360	13164	19888	61089	101226	42284
NY CHENANGO	47900	43829	43444	385	1282	3417	5576	12514	16135	4905
NY COLUMBIA	56500	52263	47901	4362	1908	4302	6854	15081	17635	6483
NY DELAWARE	46800	43430	40043	3387	1814	4128	6592	12514	14142	4240
NY DUTCHESS	233200	214310	199109	15201	4652	8604	18767	52663	93698	35726
NY GREENE	37700	35023	32218	2805	1450	3108	4919	10214	11573	3759
NY NASSAU & SUFFOLK	2626200	2421356	2315349	106007	32229	54048	73321	325088	1024140	912530
NY NEW YORK CITY	7718400	7154957	4943646	2211311	301983	543641	826412	1657714	2342681	1602526
NY ORANGE	237600	217678	196744	21134	5090	12586	19840	55779	86616	35967
NY OTSEGO	58000	54172	49875	4297	1445	4787	8182	15609	17901	6248
NY PUTNAM	65500	59082	57010	2072	1303	1798	2274	10587	27933	15187
NY ROCKLAND & WESTCHESTER	1134800	1056595	956631	99964	14705	26924	38344	137198	306152	453272
NY SCHOHARIE	30000	27810	26164	1646	1427	2631	4036	7975	8934	2807
NY SULLIVAN	58700	54591	49128	5463	2623	5144	7872	14532	19004	5416
NY ULSTER	154600	142725	131380	11345	4624	9681	15015	36354	53582	23469
CT TOTAL	1706100	1575252	1450424	124828	25869	52929	77169	300853	657732	460708
CT FAIRFIELD	791900	732508	681225	51283	10240	20179	28828	115447	284467	273347
CT LITCHFIELD	148800	137045	130090	6955	2348	4717	4606	31450	62329	29509
CT NEW HAVEN	765400	705699	639109	66590	13281	28033	41735	153956	310936	157758
DE TOTAL	405400	371752	342543	29209	7042	15355	22820	89809	155895	80031
DE NEW CASTLE	405400	371752	342543	29209	7042	15355	22820	89809	155895	80031

TABLE 4.A.2 —ESTIMATED COUNTY GROUP POPULATION, TOCKS ISLAND RECREATION SERVICE AREA, BY RACE AND AGE, 1974

	TOTAL 5 AND OVER	WHITE	NONWHITE	5-9	10-19	20-29	30-44	45-54	55-64	65 AND OVER
TOTAL SERVICE AREA	27482269	23910854	3571415	2297876	5228361	4650021	5399800	3697068	2964317	3244826
PA TOTAL	6712180	5964324	747856	555864	1317661	1104979	1273424	915082	733717	811453
PA BERKS	285750	278710	7040	22688	52122	43231	55001	41009	32881	38018
PA BRADFORD	54355	54178	177	5722	11443	8463	10251	6516	5225	6735
PA BUCKS	409198	399750	9448	41636	94017	69394	89540	47458	38092	29101
PA CARBON	48454	48332	122	3595	8753	6356	8909	7634	6121	7086
PA CENTRE	96282	94419	1863	7086	21778	29489	15943	8328	6677	6981
PA CHESTER	269530	247849	21681	25086	58923	47547	56298	32055	25702	23919
PA CLINTON	35728	35630	98	2926	7662	5890	6737	4637	3718	4158
PA COLUMBIA	53697	53542	155	4104	11040	8766	9306	7474	5993	6994
PA HARRISBURG SMSA	396577	370091	28486	32642	79887	66573	78599	52680	42239	45957
PA LACKAWANNA	221782	220496	1266	15892	40324	31765	39138	34228	27464	32971
PA LANCASTER	309120	303361	5759	27552	64176	53088	60480	37482	30054	36298
PA LEBANON	96559	96071	488	8465	19019	15780	19124	12585	10091	11495
PA LEHIGH & NORTHAMPTON	450698	444190	6508	35339	85686	72131	87140	64213	51484	54703
PA LUZERNE	324606	322434	2172	22869	57916	45778	58609	51198	41051	47165
PA LYCOMING	106976	105505	1471	9388	21905	16806	19935	13894	11140	13908
PA MONROE	46923	46166	757	3578	9274	7560	8820	6322	5069	6300
PA MONTGOMERY	587981	564421	23560	50688	120384	88704	117850	80527	64567	65261
PA MONTOUR	16754	16672	82	1271	3079	2327	2971	2414	1935	2757
PA NORTHUMBERLAND	93566	93373	193	7135	16984	12764	14683	14558	11673	13769
PA PHILADELPHIA & DELAWARE	2233135	1606205	626930	181065	422485	383858	403172	310852	249242	282461
PA PIKE	12435	12376	59	944	2141	1569	2168	1816	1456	2341
PA SCHUYLKILL	150729	150290	439	10847	27037	19266	26714	24800	19885	22180
PA SNYDER	29074	28889	185	2363	6237	5638	5450	3496	2803	3087
PA SULLIVAN	5562	5517	45	480	1158	774	912	776	622	840
PA SUSQUEHANNA	34113	34031	82	3199	7031	5357	6175	4418	3543	4390
PA UNION	27714	26917	797	2056	5662	5841	5602	3060	2453	3040
PA WAYNE	30624	30268	356	2607	5676	4092	5511	4267	3422	5049
PA WYOMING	19313	19264	49	1781	3901	3307	3625	2318	1858	2523
PA YORK	262945	255377	7568	22840	51961	42825	51961	34067	27315	31976
NJ TOTAL	6311221	5621041	690180	555349	1234404	1043342	1266032	848771	680547	682775
NJ BERGEN	845857	818045	27812	67995	163188	124204	170441	127803	102473	89753
NJ ESSEX	790555	545166	245789	66128	148572	134832	152866	107243	85987	95327
NJ HUDSON	574339	510725	63614	43323	100262	99643	108926	82781	66374	73030
NJ HUNTERDON	70441	69053	1368	6799	14287	10620	14592	8947	7174	8022
NJ MERCER	296554	246051	50503	23404	57387	52578	58349	39857	31957	33022
NJ MIDDLESEX	555920	528102	27818	52800	117132	100139	120773	68713	55094	41269
NJ MONMOUTH	446487	406616	39871	44795	92024	72548	91537	52965	42467	50151
NJ MORRIS	361910	352298	9612	37191	72782	61185	81580	43279	34701	31192
NJ OCEAN	241500	233405	8095	22050	42788	35175	42787	30594	24531	43579
NJ PASSAIC	434148	383413	50735	36336	79279	72673	82583	62595	50189	50493
NJ PHILADELPHIA SMSA-NJ	825208	738066	87142	80091	177279	148484	166482	99389	79691	73792
NJ SALEM	58852	49703	9149	5368	12205	9138	11310	8086	6483	6262
NJ SOMERSET	188661	180828	7833	18805	39040	28003	43742	24163	19374	15534
NJ SUSSEX	39226	38971	255	4061	7819	6394	8294	4675	3749	4234
NJ UNION	509523	449873	59650	39909	96219	76538	98406	77978	62523	57950
NJ WARREN	71640	70726	914	6294	14141	11189	13364	9703	7780	9169
NY TOTAL	12511864	10541547	1970317	1013383	2285099	2174126	2481400	1673909	1342141	1541806
NY ALBANY SMSA	689012	663602	25410	58289	136757	118821	122557	90416	72496	89676
NY BROOME & TIOGA	244831	241589	3242	22936	50140	39738	47473	30492	24448	29604
NY CHENANGO	43829	43491	338	4358	9293	6324	7951	5716	4583	5604
NY COLUMBIA	52263	50310	1953	4464	10170	7458	9040	7087	5682	8362
NY DELAWARE	43430	43038	392	3744	9266	6131	7207	5948	4769	6365
NY DUTCHESS	214310	198796	15514	20055	40810	37549	45707	25238	20236	24719
NY GREENE	35023	33947	1076	2752	6598	4901	5919	4917	3962	5994
NY NASSAU & SUFFOLK	2421356	2297262	124094	236358	538372	344032	517361	316286	253599	215348
NY NEW YORK CITY	7154957	5481985	1672972	517134	1165478	1358438	1389312	976686	783109	964800
NY ORANGE	217878	202833	15045	20434	43718	37046	41818	26241	21039	27562
NY OTSEGO	54172	53750	422	4118	11832	10382	8236	6567	5265	7772
NY PUTNAM	59082	58710	372	7009	12118	8843	13493	6398	5130	6091
NY ROCKLAND & WESTCHESTER	1056595	957275	99320	92324	205164	157292	223401	144230	115644	118540
NY SCHOHARIE	27810	27604	206	2370	6510	4110	4530	3397	2723	4170
NY SULLIVAN	54591	50582	4009	4344	10390	8277	9686	7623	6112	8159
NY ULSTER	142725	136773	5952	12494	28483	24768	27709	16667	13364	19040
CT TOTAL	1575252	1460949	114303	137605	310117	259871	303945	214757	172192	176765
CT FAIRFIELD	732508	676603	55905	64936	145710	[illegible]	148085	131965	81756	77606
CT LITCHFIELD	137045	135675	1370	12202	[illegible]	[illegible]	25742	16912	15163	17261
CT NEW HAVEN	705699	648671	57028	60667	[illegible]	126291	[illegible]	93880	75273	81898
DE TOTAL	371752	322993	48759	35673	81030	67702	[illegible]	44549	[illegible]	32027
DE NEW CASTLE	371752	322993	48759	35675	81380	[illegible]	[illegible]	44543	35720	32027

TABLE 4.A.3--POPULATION PROJECTED TO 2,025 BY STATE, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY CAR OWNERSHIP AND FAMILY INCOME IN 1974 DOLLARS--MEDIUM GROWTH SERIES

STATE AND YEAR	TOTAL POPU- LATION	TOTAL 5 AND OVER	CAR OWNING HOUSEHOLD	NO CAR	UNDER $4,000	$4,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 -24,999	$25,000 AND OVER
TOTAL SERVICE AREA										
1974	29730000	27482269	23211322	4270947	719352	1477634	2263957	6053041	10513434	6454851
1985	32166800	29577104	25140469	4436635	492171	1020468	1512109	4034670	10394607	12123079
1995	34092100	31672423	27053161	4619262	348671	725607	1132697	2722929	8896443	17846276
2005	35813000	33571479	28801556	4769923	250478	522996	818154	1928949	6794802	23256100
2015	37348020	35334364	30439446	4894918	184886	384081	604329	1475942	4810312	27874816
2025	38726000	36770730	31784721	4986009	135922	273474	437514	1079814	3402613	31440993
PA TOTAL										
1974	7248200	6712180	5855794	856386	169438	418550	663463	1786133	2590368	1084228
1985	7806400	7195224	6290039	905185	114086	296447	460885	1238276	2844400	2241010
1995	8200600	7631717	6690856	940861	75736	208995	343283	843883	2622528	3537292
2005	8562800	8041389	7070149	971240	52213	150651	254101	619616	2195270	4769538
2015	8883420	8407645	7412961	994684	35424	106427	184540	461652	1585491	6034111
2025	9185000	8734608	7722197	1012411	23953	69353	128858	334681	1115929	7061834
NJ TOTAL										
1974	6845200	6311221	5647397	663824	121046	259154	390257	1279806	2599973	1660985
1985	7961800	7304144	6565389	738755	86073	180104	255177	827063	2558773	3388954
1995	8739400	8098826	7303193	795633	62169	137578	220868	527446	2097756	5053009
2005	9417300	8808128	7960148	847980	42561	97604	153914	337914	1458895	6717240
2015	10009100	9437839	8543332	894507	30661	72304	114553	284832	946204	7989285
2025	10495000	9951720	9018142	933578	22262	53356	85112	212146	651091	8927753
NY TOTAL										
1974	13525100	12511864	9915164	2596700	395957	731646	1110248	2596440	4509466	3168107
1985	14067000	12939644	10316461	2623183	269098	488146	739033	1740733	4232783	5469851
1995	14619000	13594749	10898167	2696582	193954	344282	514691	1229720	3565738	7746364
2005	15107000	14170867	11422696	2748171	143397	248871	370003	892845	2715426	9800325
2015	15537000	14736369	11949026	2787343	109420	185527	274456	653805	2016370	11496791
2025	15959000	15159276	12351412	2807864	82671	136229	200318	475870	1467657	12796531
CT TOTAL										
1974	1706100	1575252	1450424	124828	25869	52929	77169	300853	657732	460700
1985	1866500	1713921	1577736	136185	17831	36484	43507	172465	589841	853753
1995	2009000	1863911	1715692	148219	12811	26203	40420	90497	457691	1236289
2005	2147000	2012139	1851953	160186	9453	19324	29813	58216	309860	1585475
2015	2290000	2162350	1990335	172015	7225	14760	22766	55735	189908	1871956
2025	2417000	2293316	2110801	182515	5451	11117	17150	41980	121702	2095916
DE TOTAL										
1974	405400	371752	342543	29209	7042	15355	22820	89809	155895	80831
1985	465100	424171	390844	33327	5083	11247	13507	56133	168690	169511
1995	524100	483220	445253	37967	3801	8549	13435	31383	152730	273322
2005	578900	538956	496610	42346	2854	6546	10323	20360	115351	383522
2015	628500	590161	543792	46369	2156	5063	8014	19918	72339	482671
2025	670000	631810	582169	49641	1585	3819	6076	15137	46234	558959

TABLE 4.A.3a --POPULATION PROJECTED TO 2,025 BY STATE, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY CAR OWNERSHIP AND FAMILY INCOME IN 1974 DOLLARS--LOW GROWTH SERIES

STATE AND YEAR	TOTAL POPU- LATION	TOTAL 5 AND OVER	CAR OWNING HOUSEHOLD	NO CAR	UNDER $4,000	$4,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 -24,999	$25,000 AND OVER
TOTAL SERVICE AREA										
1974	29730000	27482269	23211322	4270947	719352	1477634	2263957	6053041	10513434	6454851
1985	30863500	28382871	24015078	4367793	480216	989027	1468049	3889916	9963008	11592655
1995	31791500	29541967	25045872	4496095	334766	688288	1070045	2569197	8317619	16562052
2005	32682800	30646759	26029375	4617384	240176	490628	763936	1805840	6272613	21073566
2015	33617630	31769448	27030629	4738819	178248	358618	560179	1362674	4423949	24885780
2025	34608000	32871321	28026152	4845169	132509	256653	405544	995501	3135457	27945657
PA TOTAL										
1974	7248200	6712180	5855794	856386	169438	418550	663463	1786133	2590368	1084228
1985	7469500	6884909	6005905	879004	110583	285844	444699	1190628	2725688	2127467
1995	7710600	7175700	6272980	902720	72514	197620	323976	795770	2470763	3315057
2005	7887400	7407617	6484558	923059	49784	139902	234980	572020	2028325	4382606
2015	8084600	7652045	6706291	945754	34301	98231	168912	420529	1447523	5482549
2025	8326000	7918500	6958266	960234	23621	63975	117159	302651	1006430	6404664
NJ TOTAL										
1974	6845200	6311221	5647397	663824	121046	259154	390257	1279806	2599973	1660985
1985	7332300	6728592	6025627	702965	80331	173660	235071	761507	2353316	3124707
1995	7616100	7060517	6328265	732252	55483	120498	191530	454097	1826588	4412321
2005	7927600	7418920	6655090	763830	37873	84073	131781	288961	1242098	5636134
2015	8263200	7795434	7000470	794964	27345	61645	97003	240136	796452	6572803
2025	8615000	8172986	7347146	825840	20044	45655	72082	178697	547746	7308762
NY TOTAL										
1974	13525100	12511864	9915164	2596700	395957	731646	1110248	2596440	4509466	3168107
1985	13867700	12757387	10131018	2626369	267752	484657	734698	1722950	4170490	5476840
1995	14183800	13192084	10498827	2693257	191808	338906	506089	1209715	3471252	7474314
2005	14506800	13610474	10855794	2754680	141853	244252	362430	876821	2634417	9350701
2015	14828800	14019684	11205115	2814569	108736	182090	268402	638655	1960360	10861359
2025	15147000	14391875	11523591	2868284	83082	134773	197261	467317	1443371	12066071
CT TOTAL										
1974	1706100	1575252	1450424	124828	25869	52929	77169	300853	657732	460700
1985	1770000	1625295	1496222	129073	16916	34613	41266	163659	559731	809110
1995	1835000	1702454	1566897	135557	11727	23989	37016	82908	419046	1127768
2005	1892000	1773109	1631601	141508	8353	17098	26382	51544	274320	1395412
2015	1948000	1839358	1692198	147160	6171	12632	19495	47731	182071	1590458
2025	2000000	1897600	1745317	152283	4532	9287	14326	35088	102027	1732348
DE TOTAL										
1974	405400	371752	342543	29209	7042	15355	22820	89809	155895	80831
1985	424000	386688	356306	30382	4634	10253	12315	51172	153783	154531
1995	446000	411212	378903	32309	3234	7275	11434	26707	129970	232902
2005	469000	436639	402332	34307	2313	5303	8363	16494	93453	310713
2015	493000	462927	426555	36372	1693	3970	6207	15623	56743	378611
2025	520000	490360	451832	38528	1230	2963	4716	11748	35083	433820

TABLE 4.A.3b --POPULATION PROJECTED TO 2,025 BY STATE, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY CAR OWNERSHIP AND FAMILY INCOME IN 1974 DOLLARS--HIGH GROWTH SERIES

STATE AND YEAR	TOTAL POPU-LATION	TOTAL 5 AND OVER	CAR OWNING HOUSEHOLD	NO CAR	UNDER $4,000	$4,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 -24,999	$25,000 AND OVER
TOTAL SERVICE AREA										
1974	29730000	27482269	23211322	4270947	719352	1477634	2263957	6053041	10513434	6454851
1985	33036200	30375831	25862250	4513581	502534	1045767	1549968	4140874	10677087	12459601
1995	35710000	33173881	28410322	4763559	361121	755046	1180198	2837641	9296987	18742888
2005	38385000	35979946	30981818	4998128	263580	553878	867737	2043590	7229489	25021672
2015	40914930	38659422	33443265	5216157	197638	414311	653264	1598236	5204111	30591662
2025	43383000	41188951	35768562	5420389	148198	300976	482092	1191248	3750583	35315856
PA TOTAL										
1974	7248200	6712180	5855794	856386	169438	418550	663463	1786133	2590368	1084228
1985	8052200	7422010	6496976	925034	117041	306696	477963	1281269	2935041	2304000
1995	8553000	7959689	6990395	969294	78228	218140	358885	883153	2736633	3684650
2005	9134300	8577832	7558925	1018907	54757	160364	271172	662582	2338168	5090789
2015	9685900	9174815	8108814	1066001	37789	115984	201849	506411	1733264	6579518
2025	10168000	9669296	8566583	1102713	25717	76481	142990	372227	1243203	7808678
NJ TOTAL										
1974	6845200	6311221	5647397	663824	121046	259154	390257	1279806	2599973	1660985
1985	8166000	7490495	6737645	753350	88076	192888	261719	848688	2626318	3473308
1995	9172000	8499040	7672598	826442	65020	144188	232050	554931	2203173	5299678
2005	10126700	9470598	8571462	899136	45262	104241	164494	360568	1563572	7232461
2015	10963000	10336001	9371106	964895	33093	78460	124428	309543	1028536	8761941
2025	11715000	11106980	10082599	1024381	24348	58813	93930	234266	717696	9977927
NY TOTAL										
1974	13525100	12511864	9915164	2596700	395957	731646	1110248	2596440	4509466	3168107
1985	14304000	13232613	10574275	2658338	273531	496437	750855	1772728	4324991	5614071
1995	15267000	14196556	11428252	2768304	200097	355577	531720	1269432	3704822	8134908
2005	16114000	15114278	12257028	2857250	150035	260912	388090	934461	2862344	10518456
2015	16970030	16039711	13100119	2939592	116422	197697	292580	697757	2149921	12585334
2025	17925000	17024700	13998980	3025720	90041	148584	218621	519497	1598333	14449624
CT TOTAL										
1974	1706100	1575252	1450424	124828	25869	52929	77169	300853	657732	460700
1985	1954000	1794277	1651669	142608	18664	38188	45549	180498	617368	894010
1995	2174000	2017028	1856917	160111	13832	28266	43598	97551	493829	1339952
2005	2399000	2248396	2070255	178141	10512	21453	33086	64511	343657	1775177
2015	2624000	2477888	2281797	196091	8228	16758	25837	63230	215043	2148792
2025	2850000	2704300	2490441	213859	6377	12965	19977	48878	141322	2474781
DE TOTAL										
1974	405400	371752	342543	29209	7042	15355	22820	89809	155895	80831
1985	478000	435936	401685	34251	5224	11558	13882	57691	173369	174212
1995	544000	501568	462160	39408	3944	8875	13945	32574	158530	283700
2005	611000	568842	524148	44694	3014	6908	10895	21488	121748	404789
2015	672000	631007	581429	49578	2306	5412	8570	21295	77347	516077
2025	725000	683675	629959	53716	1715	4133	6574	16380	50029	604844

TABLE 4.A.4 ---POPULATION PROJECTED TO 2,025 BY STATE, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY RACE AND AGE--MEDIUM GROWTH SERIES

STATE AND YEAR	TOTAL 5 AND OVER	WHITE	NONWHITE	5-9	10-19	20-29	30-44	45-54	55-65	65 AND OVER
TOTAL SERVICE AREA										
1974	27482269	23910855	3571414	2297876	5228361	4650021	5399800	3697068	2964317	3244826
1985	29577104	25842075	3735029	2287082	4402367	5314364	7144929	3674255	2946025	3808082
1995	31672423	27780662	3891761	2595293	4793469	4349915	8336002	4107124	3293094	4197526
2005	33571479	29611056	3960423	2391729	5376055	4346062	7941013	5140897	4121972	4253771
2015	35334364	31160593	4173771	2211849	5858762	4324554	8479886	5464508	4381449	4613356
2025	36770730	32568638	4202092	2073569	6124872	4272886	9000020	5721098	4587196	4991089
PA TOTAL										
1974	6712180	5964324	747856	555864	1317661	1104979	1273424	915082	733717	811453
1985	7195224	6404885	790339	549041	1101309	1262146	1688067	905019	725645	963997
1995	7631717	6817150	814567	614455	1188243	1031166	1931078	1002289	803644	1060842
2005	8041389	7209196	832193	562103	1325746	1019466	1819201	1258224	1008846	1047803
2015	8407645	7564881	842764	517942	1433784	1000372	1931244	1327081	1064054	1133168
2025	8734608	7886924	847684	485062	1498001	995239	2041922	1380789	1107126	1226469
NJ TOTAL										
1974	6311221	5621042	690179	555349	1234404	1043343	1266032	848771	680547	682775
1985	7304144	6529520	774624	595165	1118095	1280125	1813316	897923	719956	879564
1995	8098826	7266981	831845	699516	1256145	1042760	2164701	1041993	835468	1008243
2005	8808128	7923113	885015	659525	1440864	1121684	2131351	1342819	1076668	1035217
2015	9437839	8504704	933135	622235	1594000	1128308	2319434	1458606	1169514	1145742
2025	9951720	8978988	972732	587220	1690455	1139815	2490275	1547867	1241083	1255005
NY TOTAL										
1974	12511864	10541547	1970317	1013383	2285099	2174126	2481400	1673909	1342141	1541806
1985	12939644	10949229	1990415	968259	1847687	2388308	3125614	1609679	1290646	1709451
1995	13594749	11547145	2047604	1078340	1977086	1904220	3626005	1760212	1411339	1837547
2005	14170867	12143027	2027840	979778	2184865	1873600	3400514	2140484	1716245	1875381
2015	14736369	12570473	2165896	891810	2353820	1862356	3582668	2241980	1797622	2006113
2025	15159276	13024072	2135204	827969	2438080	1795210	3769108	2324124	1863483	2141302
CT TOTAL										
1974	1575252	1460949	114303	137605	310117	259871	303945	214757	172192	176765
1985	1713921	1589904	124017	137409	263651	301462	410029	214655	172109	214606
1995	1863911	1729545	134366	157909	288663	249967	481622	245906	197167	242677
2005	2012139	1867453	144686	146326	326746	255456	458537	322260	258387	244427
2015	2162350	2007780	154570	137753	365914	255504	500100	351031	281457	270511
2025	2293316	2129712	163604	131778	385106	260212	537915	374982	300670	302653
DE TOTAL										
1974	371752	322993	48759	35675	81080	67702	74999	44549	35720	32027
1985	424171	368537	55634	37208	71625	82323	107903	46979	37669	40464
1995	483220	419841	63379	45073	83332	71802	132596	56724	45476	48217
2005	538956	468267	70689	43997	97834	75836	131410	77110	61826	50943
2015	590161	512755	77406	42109	111244	77934	146440	85810	68802	57822
2025	631810	548942	82868	41540	113230	82410	160800	93336	74834	65660

TABLE 4.A.4a --POPULATION PROJECTED TO 2,025 BY STATE, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY RACE AND AGE--LOW GROWTH SERIES

STATE AND YEAR	TOTAL 5 AND OVER	WHITE	NONWHITE	5-9	10-19	20-29	30-44	45-54	55-65	65 AND OVER
TOTAL SERVICE AREA										
1974	27482269	23910854	3571415	2297876	5228361	4650021	5399800	3697068	2964317	3244826
1985	28382871	24711836	3671035	2185732	4213031	5110368	6848021	3533104	2832853	3659762
1995	29541967	25763167	3778800	2404423	4450567	4070924	7764618	3844063	3082167	3925205
2005	30646759	26763618	3883141	2163447	4878659	3985778	7238089	4704856	3772354	3903578
2015	31769448	27780023	3989425	1969311	5236127	3871073	7621237	4933906	3956015	4181779
2025	34871321	28792232	4079089	1830833	5429970	3845147	8030404	5127384	4111156	4496427
PA TOTAL										
1974	6712180	5964324	747856	555864	1317661	1104979	1273424	915082	733717	811453
1985	6884909	6113183	771726	524603	1052348	1208404	1612874	866917	695097	924666
1995	7175700	6386706	788994	577026	1114732	970442	1813887	942766	755913	1000934
2005	7407617	6602540	805077	516433	1218214	940173	1672231	1160869	930787	968910
2015	7652045	6827962	824083	469942	1300872	912286	1753016	1209923	970119	1035887
2025	7918500	7087253	831247	438409	1353903	903594	1846602	1253995	1005461	1116536
NJ TOTAL										
1974	6311221	5621041	690180	555349	1234404	1043343	1266032	848771	680547	682775
1985	6728592	5990641	737951	545493	1028875	1180595	1669249	830857	666183	807340
1995	7060517	6292642	767875	604939	1092658	954600	1883941	915559	734094	874726
2005	7418920	6619326	799594	549670	1210167	946828	1792275	1139183	913395	867402
2015	7795434	6964129	831305	507973	1312034	934106	1911752	1213963	973358	942248
2025	8172986	7309962	863024	476725	1383350	937535	2040970	1280798	1026948	1026660
NY TOTAL										
1974	12511864	10541547	1970317	1013383	2285099	2174126	2481400	1673909	1342141	1541806
1985	12757387	10764121	1993266	951411	1816507	2360446	3078770	1588950	1274025	1687270
1995	13192084	11146750	2045334	1039897	1908626	1856278	3514279	1712896	1373401	1786707
2005	13610474	11516826	2093648	932784	2083126	1811927	3263359	2058424	1650447	1810407
2015	14019684	11878594	2141090	841252	2224652	1745677	3416560	2144232	1719248	1920066
2025	14391875	12207880	2183995	774459	2286237	1724058	3573432	2210021	1771997	2051671
CT TOTAL										
1974	1575252	1460949	114303	137605	310117	259871	303945	214757	172192	176765
1985	1625295	1507921	117374	130305	250005	265875	388760	203552	163208	203590
1995	1702454	1579792	122662	144205	263637	228502	439673	224571	180060	221806
2005	1773109	1645557	127552	128916	287491	225411	403761	283907	227636	219587
2015	1839358	1707129	132229	117113	311308	217872	425040	298479	239321	230225
2025	1897600	1761093	136507	109000	318600	216000	444600	310130	248670	250600
DE TOTAL										
1974	371752	322993	48759	35675	81080	67702	74999	44549	35720	32027
1985	386688	335970	50718	33920	65296	75048	98368	42828	34340	36888
1995	411212	357277	53935	38356	70914	61102	112838	48271	38699	41032
2005	436639	379369	57270	35644	79261	61439	106463	62471	50089	41272
2015	462927	402209	60718	33031	87261	61132	114869	67309	53969	45356
2025	490360	426044	64316	32240	87880	63960	124800	72440	58080	50960

TABLE 4.A.4b--POPULATION PROJECTED TO 2,025 BY STATE, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY RACE AND AGE--HIGH GROWTH SERIES

STATE AND YEAR	TOTAL 5 AND OVER	WHITE	NONWHITE	5-9	10-19	20-29	30-44	45-54	55-65	65 AND OVER
TOTAL SERVICE AREA										
1974	27482269	23865854	3616415	2297876	5228361	4650021	5399800	3697068	2964317	3244826
1985	30375831	26570870	3804961	2351518	4526333	5452994	7340875	3771899	3024318	3907894
1995	33173881	29162653	4011228	2724293	5030500	4548877	8737382	4297807	3445981	4389041
2005	35979946	31767258	4212688	2571571	5777774	4447113	8517835	5507234	4415780	4542639
2015	38659422	34263138	4396284	2432071	6440068	4668965	9299557	5982669	4804911	5031201
2025	41188951	36621073	4567878	2332117	6885612	4769683	10097305	6405906	5136272	5562056
PA TOTAL										
1974	6712180	5919324	792856	555864	1317661	1104979	1273424	915082	733717	811453
1985	7422010	6622188	799822	566256	1136390	1301847	1741887	933343	748355	993932
1995	7959689	7128641	831048	641106	1240442	1075641	2014610	1044658	837616	1105616
2005	8577832	7714214	863618	600394	1416111	1087963	1942061	1340518	1074912	1115873
2015	9174815	8283986	890829	565335	1565477	1091250	2107118	1445198	1166763	1233874
2025	9669296	8759685	909611	537072	1659717	1102308	2260739	1527243	1224551	1357666
NJ TOTAL										
1974	6311221	5621042	690179	555349	1234404	1043363	1266032	848771	680547	682775
1985	7490995	6700383	790612	611004	1147151	1313161	1860041	919925	737598	902115
1995	8499040	7633576	865464	735282	1319500	1146955	2273044	1091869	875455	1056935
2005	9470598	8529973	940625	710722	1551406	1206508	2293345	1442069	1156248	1110300
2015	10336001	9328625	1007376	683178	1748818	1236422	2542996	1595186	1279023	1250378
2025	11106980	10039605	1067375	657145	1890110	1273240	2783655	1724968	1383082	1394780
NY TOTAL										
1974	12511864	10541546	1970318	1013383	2285099	2174126	2481400	1673909	1342141	1541806
1985	13232613	11205215	2027398	992167	1893162	2437780	3198768	1645630	1319472	1745634
1995	14196556	12093077	2103479	1130201	2071656	1981537	3790575	1836244	1472301	1914042
2005	15114278	12941718	2172560	1050445	2341815	1987810	3630774	2283012	1830521	1989901
2015	16039711	13801578	2238133	980599	2587470	1965849	3918748	2448093	1962883	2176029
2025	17024700	14716543	2308157	937500	2758860	1999160	4243361	2610265	2092924	2382610
CT TOTAL										
1974	1575252	1460949	114303	137605	310117	259871	303945	214757	172192	176765
1985	1794277	1664325	129952	143851	276018	315600	429283	224719	180179	224627
1995	2017028	1871577	145451	170920	312406	270216	521522	266158	213406	262400
2005	2248396	2087120	161276	163573	365183	284791	512958	360249	288845	272797
2015	2477888	2300705	177183	157936	419360	292096	574080	402442	322678	309296
2025	2704300	2511236	193064	155450	454400	305800	639550	442412	354738	355950
DE TOTAL										
1974	371752	322993	48759	35675	81080	67702	74999	44549	35720	32027
1985	435936	378759	57177	38240	73612	84606	110896	48282	38714	41586
1995	501568	435782	65786	46784	86496	74528	137631	58878	47203	50048
2005	568842	494233	74609	46437	103259	80041	138697	81386	65254	53768
2015	631007	548244	82763	45023	118943	83328	156575	91750	73564	61824
2025	683675	594004	89671	44950	122525	89175	174000	100998	80977	71050

TABLE 4.A.5 --PENNSYLVANIA RECREATION PARTICIPATION RATES, 14 ACTIVITIES, BY CAR OWNERSHIP AND FAMILY INCOME, 1974

ACTIVITY AND RATE	TOTAL 5 AND OVER	CAR OWNING HOUSEHOLD	NO CAR	UNDER $4,000	$4,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 -24,999	$25,000 AND OVER
SWIMMING									
PERCENT PARTICIPATING ANNUALLY	69.1	69.8	20.6	29.0	34.2	65.9	76.4	82.5	86.6
ACTIVITY DAYS PER PARTICIPANT	33.6	31.0	34.2	21.9	27.6	25.9	30.7	36.9	39.7
ACTIVITY DAYS PER CAPITA	23.2	21.6	7.0	6.4	9.4	17.1	23.5	30.4	34.3
PICNICKING									
PERCENT PARTICIPATING ANNUALLY	70.0	72.2	44.8	44.2	55.7	73.9	79.4	75.5	69.2
ACTIVITY DAYS PER PARTICIPANT	8.6	8.8	6.3	6.2	7.6	8.7	9.5	8.8	7.4
ACTIVITY DAYS PER CAPITA	6.0	6.4	2.8	2.8	4.2	6.4	7.5	6.7	5.1
SIGHTSEEING OR DRIVING FOR PLEASURE									
PERCENT PARTICIPATING ANNUALLY	72.5	74.4	43.5	47.4	64.0	72.6	76.4	80.6	81.0
ACTIVITY DAYS PER PARTICIPANT	23.3	23.5	19.5	24.9	23.2	23.9	23.6	24.8	18.2
ACTIVITY DAYS PER CAPITA	16.9	17.5	8.5	11.8	14.9	17.3	18.1	19.9	14.8
BICYCLING									
PERCENT PARTICIPATING ANNUALLY	49.2	50.1	13.9	19.7	21.5	46.0	56.0	63.1	65.3
ACTIVITY DAYS PER PARTICIPANT	63.3	63.4	82.1	67.2	58.6	57.8	64.9	65.5	64.8
ACTIVITY DAYS PER CAPITA	31.1	31.8	11.4	13.3	12.6	26.6	36.4	41.4	42.3
BOATING, CANOEING OR WATERSKIING									
PERCENT PARTICIPATING ANNUALLY	33.9	32.1	9.3	15.2	14.7	26.9	35.8	40.4	46.7
ACTIVITY DAYS PER PARTICIPANT	8.8	8.5	5.6	4.8	12.3	7.3	7.8	9.8	11.3
ACTIVITY DAYS PER CAPITA	3.0	2.7	0.5	0.7	1.8	2.0	2.8	3.9	5.3
FISHING									
PERCENT PARTICIPATING ANNUALLY	32.0	33.5	8.9	14.0	17.4	31.0	37.7	36.8	39.9
ACTIVITY DAYS PER PARTICIPANT	14.8	14.6	17.1	20.0	21.8	14.4	14.7	12.9	10.1
ACTIVITY DAYS PER CAPITA	4.7	4.9	1.5	2.8	3.8	4.6	5.6	4.8	4.0
HUNTING									
PERCENT PARTICIPATING ANNUALLY	14.2	14.9	0.7	5.3	10.0	16.1	16.6	16.4	12.6
ACTIVITY DAYS PER PARTICIPANT	14.8	15.9	1.8	21.5	19.0	16.1	17.3	9.8	14.6
ACTIVITY DAYS PER CAPITA	2.1	2.4	0.0	1.1	1.9	2.6	2.9	1.4	1.9
HIKING OR NATURE WALKS									
PERCENT PARTICIPATING ANNUALLY	40.6	42.2	20.0	19.7	28.9	43.9	47.1	45.2	46.8
ACTIVITY DAYS PER PARTICIPANT	17.8	18.1	23.7	18.6	26.4	18.7	19.1	13.8	16.9
ACTIVITY DAYS PER CAPITA	7.2	7.6	4.7	3.7	7.6	8.2	9.0	6.2	7.8
CAMPING									
PERCENT PARTICIPATING ANNUALLY	26.3	27.8	4.6	9.3	13.6	29.2	28.6	34.1	30.1
ACTIVITY DAYS PER PARTICIPANT	11.1	10.9	6.2	7.9	8.6	10.4	12.3	11.7	9.0
ACTIVITY DAYS PER CAPITA	2.9	3.0	0.3	0.7	1.2	3.0	3.5	4.0	2.7
HORSEBACK RIDING									
PERCENT PARTICIPATING ANNUALLY	11.2	11.6	4.1	6.3	4.7	10.6	12.8	13.3	19.9
ACTIVITY DAYS PER PARTICIPANT	18.0	17.9	3.6	7.8	7.7	19.9	21.5	6.6	33.8
ACTIVITY DAYS PER CAPITA	2.0	2.1	0.2	0.5	0.4	2.1	2.8	0.9	5.4
OFF-ROAD MOTORCYCLING OR RIDING SNOWMOBILES									
PERCENT PARTICIPATING ANNUALLY	12.2	12.7	1.5	3.6	4.8	13.1	13.8	15.6	16.3
ACTIVITY DAYS PER PARTICIPANT	24.9	25.3	5.6	8.4	47.5	29.3	26.8	21.1	11.1
ACTIVITY DAYS PER CAPITA	3.0	3.2	0.1	0.3	2.3	3.8	3.7	3.3	1.8
ICE SKATING									
PERCENT PARTICIPATING ANNUALLY	22.1	22.4	3.0	7.4	4.8	19.9	24.3	32.6	32.4
ACTIVITY DAYS PER PARTICIPANT	8.6	8.7	14.8	8.2	8.1	8.1	8.6	10.5	6.6
ACTIVITY DAYS PER CAPITA	1.9	2.0	0.4	0.6	0.4	1.6	2.1	3.4	2.1
GOLF OR MINIATURE GOLF									
PERCENT PARTICIPATING ANNUALLY	32.4	30.4	7.0	7.6	10.7	25.8	32.0	41.6	46.6
ACTIVITY DAYS PER PARTICIPANT	13.1	13.4	6.4	4.8	7.6	10.6	11.4	16.8	17.3
ACTIVITY DAYS PER CAPITA	4.2	4.1	0.5	0.4	0.8	2.7	3.7	7.0	8.1
TENNIS									
PERCENT PARTICIPATING ANNUALLY	29.4	25.3	4.1	9.3	9.3	17.1	26.4	37.5	49.8
ACTIVITY DAYS PER PARTICIPANT	21.2	21.3	16.0	17.9	15.7	12.6	20.3	21.9	31.1
ACTIVITY DAYS PER CAPITA	6.2	5.4	0.7	1.7	1.5	2.2	5.4	8.2	15.5

TABLE 4.A.6—PENNSYLVANIA RECREATION PARTICIPATION RATES, 14 ACTIVITIES, BY RACE AND AGE, 1974

ACTIVITY AND RATE	TOTAL 5 AND OVER	WHITE	NONWHITE	5-9	10-19	20-29	30-44	45-54	55-64	65 AND OVER
SWIMMING										
PERCENT PARTICIPATING ANNUALLY	69.1	67.8	44.4	93.0	91.0	83.4	75.7	54.8	32.6	11.7
ACTIVITY DAYS PER PARTICIPANT	33.6	31.3	22.7	42.9	39.4	26.4	26.7	24.9	19.3	20.1
ACTIVITY DAYS PER CAPITA	23.2	21.2	10.1	39.8	35.9	22.0	20.2	13.7	6.3	2.4
PICNICKING										
PERCENT PARTICIPATING ANNUALLY	70.0	71.0	64.4	88.6	77.9	85.0	77.6	64.8	52.9	35.3
ACTIVITY DAYS PER PARTICIPANT	8.6	8.8	7.0	10.3	7.8	9.5	9.5	7.9	7.6	6.5
ACTIVITY DAYS PER CAPITA	6.0	6.2	4.5	9.1	6.1	8.0	7.4	5.1	4.0	2.3
SIGHTSEEING OR DRIVING FOR PLEASURE										
PERCENT PARTICIPATING ANNUALLY	72.5	73.1	60.5	81.4	70.6	83.3	77.3	71.6	66.3	51.1
ACTIVITY DAYS PER PARTICIPANT	23.3	22.9	33.5	21.4	24.2	30.2	20.5	19.3	21.7	25.4
ACTIVITY DAYS PER CAPITA	16.9	16.8	20.3	17.4	17.1	25.1	15.9	13.8	14.4	13.0
BICYCLING										
PERCENT PARTICIPATING ANNUALLY	49.2	48.2	41.0	81.4	85.4	59.1	47.9	28.4	10.7	3.1
ACTIVITY DAYS PER PARTICIPANT	63.3	63.1	78.4	110.7	90.8	38.0	27.6	35.5	31.1	52.5
ACTIVITY DAYS PER CAPITA	31.1	30.4	32.1	90.1	77.6	22.5	13.2	10.1	3.3	1.6
BOATING, CANOEING OR WATERSKIING										
PERCENT PARTICIPATING ANNUALLY	33.9	31.5	13.3	31.0	44.1	46.4	30.1	24.7	15.1	7.8
ACTIVITY DAYS PER PARTICIPANT	8.8	8.5	5.2	9.5	6.4	6.8	9.4	10.6	10.1	20.2
ACTIVITY DAYS PER CAPITA	3.0	2.7	0.7	3.6	2.8	3.2	2.8	2.6	1.5	1.6
FISHING										
PERCENT PARTICIPATING ANNUALLY	32.0	32.7	18.0	38.4	53.7	32.9	32.7	24.6	18.5	8.4
ACTIVITY DAYS PER PARTICIPANT	14.8	14.5	20.7	9.2	13.3	17.7	15.0	15.4	16.2	22.3
ACTIVITY DAYS PER CAPITA	4.7	4.7	3.7	3.5	7.2	5.8	4.9	3.8	3.0	1.9
HUNTING										
PERCENT PARTICIPATING ANNUALLY	14.2	14.6	2.7	1.8	19.9	20.8	17.6	10.8	9.1	5.1
ACTIVITY DAYS PER PARTICIPANT	14.8	15.9	13.5	6.9	15.6	16.4	14.7	18.9	12.0	25.3
ACTIVITY DAYS PER CAPITA	2.1	2.3	0.4	0.1	3.1	3.4	2.6	2.0	1.1	1.3
HIKING OR NATURE WALKS										
PERCENT PARTICIPATING ANNUALLY	40.6	41.4	30.1	58.6	50.0	52.3	45.6	32.9	25.2	11.6
ACTIVITY DAYS PER PARTICIPANT	17.8	18.3	15.6	17.7	15.7	16.1	16.8	18.3	27.6	44.5
ACTIVITY DAYS PER CAPITA	7.2	7.6	4.7	10.4	7.8	8.4	7.6	6.0	7.0	5.2
CAMPING										
PERCENT PARTICIPATING ANNUALLY	26.3	27.3	6.7	33.8	43.8	32.8	28.6	18.7	8.5	3.8
ACTIVITY DAYS PER PARTICIPANT	11.1	10.9	11.3	8.7	11.3	9.5	11.1	10.9	18.7	10.8
ACTIVITY DAYS PER CAPITA	2.9	3.0	0.8	3.0	5.0	3.1	3.2	2.0	1.6	0.4
HORSEBACK RIDING										
PERCENT PARTICIPATING ANNUALLY	11.2	11.2	9.9	20.4	23.0	17.0	7.3	4.6	1.1	0.7
ACTIVITY DAYS PER PARTICIPANT	18.0	18.1	7.1	26.8	14.7	14.8	25.0	11.7	6.3	9.7
ACTIVITY DAYS PER CAPITA	2.0	2.0	0.7	5.5	3.4	2.5	1.8	0.5	0.1	0.1
OFF-ROAD MOTORCYCLING OR RIDING SNOWMOBILES										
PERCENT PARTICIPATING ANNUALLY	12.2	12.4	3.2	10.3	22.5	22.7	10.8	5.0	2.1	0.3
ACTIVITY DAYS PER PARTICIPANT	24.9	25.1	34.8	17.0	36.1	20.4	18.2	13.8	21.1	29.2
ACTIVITY DAYS PER CAPITA	3.0	3.1	1.1	1.7	8.1	4.6	2.0	0.7	0.4	0.1
ICE SKATING										
PERCENT PARTICIPATING ANNUALLY	22.1	22.1	4.8	27.2	47.3	28.7	17.9	9.4	2.2	0.2
ACTIVITY DAYS PER PARTICIPANT	8.6	8.8	7.5	8.1	10.0	9.3	5.7	9.5	3.9	19.1
ACTIVITY DAYS PER CAPITA	1.9	1.9	0.3	2.2	4.7	2.7	1.0	0.9	0.1	0.0
GOLF OR MINIATURE GOLF										
PERCENT PARTICIPATING ANNUALLY	32.4	30.0	9.6	31.0	45.3	39.8	30.5	20.2	14.9	5.1
ACTIVITY DAYS PER PARTICIPANT	13.1	13.3	4.6	3.2	8.5	10.6	14.4	20.4	43.0	26.8
ACTIVITY DAYS PER CAPITA	4.2	4.0	0.4	1.0	3.8	4.2	4.4	4.1	6.4	1.4
TENNIS										
PERCENT PARTICIPATING ANNUALLY	29.4	24.8	7.9	17.0	45.9	43.1	20.4	14.4	3.9	1.2
ACTIVITY DAYS PER PARTICIPANT	21.2	21.4	17.6	8.6	19.4	24.9	21.8	20.8	34.3	9.6
ACTIVITY DAYS PER CAPITA	6.2	5.3	1.4	1.5	8.9	10.7	4.4	3.0	1.3	0.1

TABLE 4.A.7---PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
TOTAL SERVICE AREA			PARTICIPANTS											
1974	20268333	19311158	19876067	14141492	9800730	8150838	3592909	10942144	6757215	3077000	3006086	6238927	10197568	9345420
1985	22417136	20771460	21446506	15235839	11164973	8811444	3879706	11751008	7263648	3127910	3250961	6591219	11791521	11400053
1995	24398483	22161615	22830220	16391293	12417847	9468051	4167388	12511906	7779190	3229384	3496006	7013139	13773119	13237416
2005	26102822	23391546	24085120	17312248	13528447	10066812	4436860	13160139	8239463	3349249	3719751	7404797	14553513	14852743
2015	27667770	24562761	25265367	18234222	14507162	10626278	4664209	13805168	8686005	3479191	3929122	7802840	15459590	16233997
2025	28914228	25506329	26212715	18931552	15294244	11084783	4875831	14313719	9043596	3557816	4100918	8086333	16548187	17336570
			ACTIVITY DAYS											
1974	713442	167686	467785	840931	95587	120071	56966	198437	72583	58074	80263	50996	129576	200971
1985	822301	181589	504627	814551	114506	129762	61522	213878	78076	66767	82024	50904	152373	254866
1995	921008	192781	527382	872880	131525	139398	66091	229344	83806	76754	85350	52635	172192	302985
2005	1005132	201199	554379	907660	146540	148181	70377	243574	88992	85013	90308	55555	189273	348160
2015	1078749	210275	590393	940239	159516	156385	74062	256348	93937	93033	95140	58266	203685	387105
2025	1137498	217537	600907	958018	169841	163106	77349	267180	97913	99052	98746	59937	215552	417465
PA TOTAL			PARTICIPANTS											
1974	4887542	4714345	4852909	3423098	2346147	2036651	892327	2685743	1683901	752021	754605	1512698	2381447	2150555
1985	5387879	5047187	5201595	3670122	2662780	2186376	957891	2866996	1796996	758389	810146	1589404	2780965	2626542
1995	5821221	5332126	5482575	3916088	2944269	2323740	1018825	3020899	1903557	776030	861658	1679092	3123429	3054202
2005	6200774	5596528	5753306	4118099	3194698	2453432	1076620	3159714	2002947	800730	910160	1765630	3416674	3424757
2015	6564418	5837994	5993804	4314572	3421723	2570282	1128911	3290965	2095596	825798	953963	1849820	3677351	3766719
2025	6841972	6052293	6208303	4479703	3617256	2675396	1176125	3406658	2177570	844602	993388	1917381	3900732	4055002
			ACTIVITY DAYS											
1974	168723	40415	113912	206953	22208	29955	14157	48827	18150	13668	19855	12528	30560	45186
1985	194322	43970	122356	198639	26564	32154	15198	52174	19375	15344	20127	12401	36007	57176
1995	216969	46195	126758	210755	30474	34169	16167	55620	20566	17454	20757	12716	40643	68206
2005	236148	47953	132449	218195	33905	36071	17086	58682	21692	19248	21836	13357	44548	78582
2015	253401	49779	137681	224664	37084	37784	17917	61434	22722	21275	22875	13909	48037	88535
2025	268119	51419	142409	228866	39767	39324	18669	63904	23633	22931	23680	14308	51019	96778
PA BERKS			PARTICIPANTS											
1974	209054	200449	204963	143852	101331	88456	40939	113810	72533	30507	32922	62781	103156	92572
1985	228195	211010	217169	152750	114442	93650	43343	119840	76352	30374	34855	65439	120413	114311
1995	244712	221944	227122	161478	125448	98514	45594	125194	80076	30803	36666	68477	133966	132172
2005	259583	232331	237758	169204	136306	103557	47928	130509	83884	31598	38542	71635	146540	149379
2015	273726	242671	248077	177143	145657	108449	50192	136023	87718	32596	40363	74890	156995	163233
2025	286418	252334	257766	184080	153786	113049	92320	141118	91290	33335	42075	77745	166144	174750
			ACTIVITY DAYS											
1974	7263	1726	4791	8381	950	1299	651	2151	785	554	820	510	1359	1897
1985	8360	1833	5078	7959	1147	1376	690	2277	827	628	822	499	1602	2444
1995	9248	1910	5224	8355	1311	1447	725	2395	868	722	840	507	1788	2952
2005	10067	1978	5450	8563	1470	1521	762	2518	912	820	879	530	1956	3467
2015	10761	2056	5675	8827	1599	1593	798	2637	954	909	919	551	2094	3877
2025	11363	2129	5889	8952	1707	1660	832	2749	994	973	955	568	2216	4201
PA BRADFORD			PARTICIPANTS											
1974	38360	38534	39274	27672	18106	17373	7926	22312	14365	6381	6511	12311	17641	15350
1985	42529	41046	41979	29625	20742	18553	8464	23662	15237	6370	6954	12903	21060	19261
1995	46874	43929	44833	32126	23467	19952	9102	25233	16324	6592	7478	13834	24365	23177
2005	51004	46849	47801	34476	26092	21356	9743	26817	17431	6923	8004	14868	27443	26984
2015	54836	49646	50591	36704	28527	22712	10361	28337	18500	7245	8512	15834	30263	30485
2025	58537	52470	53452	38935	30791	24035	10965	29912	19562	7548	9008	16788	32837	33640
			ACTIVITY DAYS											
1974	1270	336	923	1823	163	255	126	412	156	111	168	106	236	314
1985	1487	360	987	1737	198	272	135	441	165	121	169	104	282	406
1995	1706	382	1036	1861	234	292	145	474	177	138	176	108	327	502
2005	1909	404	1101	1950	269	313	155	507	190	157	189	115	368	607
2015	2096	425	1164	2034	302	335	165	539	201	175	201	122	406	703
2025	2268	448	1230	2116	331	352	175	571	213	193	212	128	441	791
PA BUCKS			PARTICIPANTS											
1974	315618	294269	301318	227320	153537	133834	58700	173732	111898	51188	50405	102510	158746	147356
1985	364173	331530	340992	254332	183448	151029	66242	194935	125413	53807	56981	111995	193920	190566
1995	413050	370297	380232	285962	212427	169102	74169	217372	140174	56699	63688	124721	226646	230638
2005	458707	406902	417577	312882	240395	186496	82018	237577	154279	63055	70427	136294	257401	268117
2015	504341	446747	455832	341215	267035	205178	89993	258884	168889	67741	77275	148466	286131	301791
2025	547091	480730	492530	368414	291225	222136	97430	279427	182642	72365	83661	160087	312465	331731
			ACTIVITY DAYS											
1974	11278	2613	7078	14440	1493	1959	934	3082	1213	925	1350	852	2104	3182
1985	13594	2962	7984	14484	1899	2210	1054	3478	1360	1142	1428	879	2588	4346
1995	15823	3300	8762	16277	2280	2475	1180	3894	1522	1401	1563	959	3031	5431
2005	17884	3575	9578	17546	2636	2737	1305	4306	1680	1618	1717	1050	3440	6473
2015	19831	3861	10431	18792	2959	3003	1432	4725	1841	1824	1876	1140	3820	7385
2025	21623	4184	11250	20001	3247	3251	1550	5115	1992	2001	2023	1223	4171	8168
PA CARBON			PARTICIPANTS											
1974	33363	33762	34425	22973	15769	14989	7069	19016	12207	4937	5578	9937	15314	12991
1985	37222	36035	36839	24801	18161	16041	7566	20211	12980	4936	5969	10512	18456	16442
1995	41599	38801	39593	27207	20723	17335	8176	21702	13989	5165	6651	11436	21594	20035
2005	46102	42212	43048	29869	23664	18941	8934	23517	15237	5529	7048	12563	25046	24174
2015	50848	45730	46614	32671	26623	20549	9692	25439	16519	5925	7647	13751	28502	28449
2025	55320	49165	50070	35236	29412	22156	10450	27282	17776	6267	8245	14803	31674	32331
			ACTIVITY DAYS											
1974	1088	287	799	1372	139	220	113	368	132	88	135	83	203	255
1985	1286	308	855	1309	170	236	120	394	141	94	136	82	245	331
1995	1494	330	906	1415	202	255	130	425	152	108	143	86	288	415
2005	1722	355	982	1521	240	278	142	465	166	127	156	94	334	524
2015	1951	383	1061	1622	280	302	154	504	180	149	170	101	381	641
2025	2162	410	1139	1708	317	325	166	544	194	170	182	108	424	746

JDE ASSOCIATES, INC.

TABLE 4.A.7---PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA CENTRE			PARTICIPANTS											
1974	70459	69446	71971	52677	33113	30740	13855	41261	25991	13126	11518	24508	32726	29175
1985	76584	72430	75285	55121	36832	32016	14430	42843	26918	12995	11997	25170	37868	35280
1995	81217	75268	77626	57642	40006	33219	14972	44151	27850	12992	12447	26028	41963	40502
2005	85216	77559	79951	59406	43023	34439	15522	45256	28724	13026	12905	26687	45616	45525
2015	88732	79741	82033	61490	45487	35526	16012	46432	29597	13339	13312	27662	48535	49527
2025	91110	81202	83486	62637	47250	36281	16352	47171	30157	13412	13595	28106	50620	52428
			ACTIVITY DAYS											
1974	2364	629	1791	3319	308	451	220	726	279	219	343	219	432	654
1985	2686	660	1877	3103	362	469	230	756	289	231	339	213	504	803
1995	2454	679	1896	3207	408	487	238	785	300	253	342	213	560	936
2005	3188	691	1938	3234	454	505	247	814	310	278	349	216	609	1082
2015	3382	706	1981	3352	491	521	255	839	320	302	361	224	648	1201
2025	3517	715	2013	3367	517	532	260	857	326	318	366	226	676	1288
PA CHESTER			PARTICIPANTS											
1974	206338	192193	197325	146861	101155	86855	36825	112730	72345	32744	32610	65875	104686	98207
1985	251350	228243	235313	173818	127212	103260	43780	133409	85499	36477	38769	76365	134676	133070
1995	297992	266266	273862	203700	154059	121034	51317	155115	99871	41196	45442	88517	164695	167894
2005	347117	306998	315621	234555	182525	140192	59439	178138	115299	46842	52635	101873	195609	204061
2015	399117	350802	360210	267957	211788	160697	68133	203057	131956	52819	60334	116437	227438	239962
2025	453774	397435	407881	302973	242120	182456	77359	229612	149591	58994	68503	131468	260370	276331
			ACTIVITY DAYS											
1974	7397	1694	4655	9092	994	1272	585	1985	783	620	868	544	1359	2161
1985	9411	2025	5545	9616	1325	1513	695	2360	926	792	973	596	1767	3058
1995	11453	2348	6337	11261	1658	1773	815	2766	1084	1000	1108	674	2167	3955
2005	13555	2676	7280	12856	2005	2054	944	3204	1254	1222	1281	780	2571	4934
2015	15725	3040	8290	14459	2351	2354	1082	3672	1437	1434	1469	888	2998	5870
2025	17970	3432	9372	16045	2703	2673	1229	4170	1630	1642	1659	997	3423	6795
PA CLINTON			PARTICIPANTS											
1974	25173	25298	25810	18011	11788	11333	5212	14580	9371	4130	4241	8037	11417	9753
1985	26555	25464	26078	18324	12875	11431	5257	14616	9388	3887	4277	8003	13136	11830
1995	27578	25596	26152	18734	13763	11542	5308	14643	9448	3784	4319	8100	14402	13575
2005	28446	26366	26935	19168	14260	11939	5491	15024	9743	3836	4468	8302	14932	14094
2015	29202	26493	27034	19469	15005	12028	5532	15065	9802	3811	4501	8428	15913	15667
2025	29732	26569	27091	19638	15565	12092	5561	15077	9838	3770	4525	8480	16652	16878
			ACTIVITY DAYS											
1974	820	220	608	1145	104	166	83	271	102	71	111	70	151	199
1985	923	222	614	1025	122	168	84	274	102	71	105	64	175	246
1995	1004	222	605	1036	137	169	84	276	103	77	103	63	192	291
2005	1038	226	621	1054	142	175	87	286	106	78	107	65	199	302
2015	1101	226	622	1045	155	176	88	288	107	87	107	65	213	353
2025	1147	226	622	1029	166	177	89	289	107	94	107	65	223	392
PA COLUMBIA			PARTICIPANTS											
1974	37501	37788	38537	26498	17626	16934	7832	21623	13926	5999	6329	11754	17096	14557
1985	41197	39620	40541	28108	20029	17794	8230	22581	14538	5901	6650	12205	20389	18288
1995	44179	41095	41955	29679	22097	18537	8574	23345	15096	5920	6928	12757	23065	21631
2005	46158	41979	42863	30529	23702	19013	8793	23752	15432	5944	7105	13119	25105	24541
2015	47849	42824	43675	31353	25040	19453	8997	24171	15764	5977	7270	13476	26793	26967
2025	49206	43619	44450	32033	26097	19857	9184	24576	16071	6012	7421	13748	28058	28820
			ACTIVITY DAYS											
1974	1222	325	909	1653	156	248	125	408	151	103	163	102	226	294
1985	1428	343	957	1547	189	261	131	428	158	109	161	98	271	378
1995	1603	353	973	1609	218	272	136	446	164	121	163	99	307	461
2005	1733	357	990	1619	244	279	140	458	168	134	166	101	335	547
2015	1841	362	1006	1624	265	285	143	468	172	147	170	102	359	620
2025	1924	367	1022	1632	282	291	146	478	175	157	173	104	376	677
PA HARRISBURG SMSA			PARTICIPANTS											
1974	292804	281200	288336	205545	140906	124803	54882	161807	103131	45233	46568	91047	142462	128081
1985	328965	306553	315409	224488	163123	136272	59925	175784	111933	46422	50847	97509	170267	160398
1995	363691	331817	340668	245219	184391	148116	65134	189684	121284	48628	55267	105440	195623	190698
2005	395413	355521	364961	263087	204343	159404	70098	202386	130079	51211	59478	113142	218608	218897
2015	419826	373167	382928	276818	220415	167891	73830	212014	136762	52900	62645	118818	236644	242799
2025	441352	384604	399249	288997	234231	175646	77240	220753	142834	54440	65539	123859	252184	262531
			ACTIVITY DAYS											
1974	10095	2443	6786	12420	1322	1832	872	2946	1116	818	1209	756	1845	2684
1985	11893	2680	7426	12133	1619	2000	952	3216	1211	927	1246	761	2228	3478
1995	13583	2884	7875	13197	1901	2174	1035	3496	1315	1077	1315	799	2572	4241
2005	15103	3054	8405	13929	2164	2340	1116	3762	1413	1217	1412	857	2878	5012
2015	16298	3190	8794	14344	2388	2464	1173	3963	1487	1368	1482	894	3116	5719
2025	17327	3315	9159	14694	2572	2578	1227	4146	1554	1483	1544	925	3320	6279
PA LACKAWANNA			PARTICIPANTS											
1974	155082	154571	157653	106474	73856	67246	32271	86551	54900	22867	24912	46253	73057	63492
1985	162107	154728	158227	107855	79762	67467	32377	86307	54744	21492	24993	45953	82340	75207
1995	168448	155949	159131	110358	85165	68331	32792	86654	55230	20943	25313	46551	89879	85504
2005	173542	157373	160606	112360	89791	69128	33176	87209	55768	20883	25608	47434	95939	94777
2015	176936	158131	161175	113680	93116	69439	33420	87444	56113	20739	25798	48021	100315	101722
2025	178313	157855	160759	113628	95047	69714	33456	87071	56058	20349	25826	47894	102863	106135
			ACTIVITY DAYS											
1974	5167	1315	3687	6282	670	989	514	1681	594	413	619	386	967	1278
1985	5723	1322	3697	5628	768	992	515	1687	592	424	586	357	1096	1561
1995	6203	1323	3663	5683	857	1005	522	1709	599	459	576	349	1199	1829
2005	6567	1324	3683	5678	938	1017	528	1728	605	505	584	354	1282	2118
2015	6863	1326	3690	5627	999	1024	532	1741	610	542	589	355	1342	2339
2025	7016	1316	3677	5491	1038	1025	533	1743	609	566	585	350	1377	2467

IDE ASSOCIATES, INC.

TABLE 4.A.7—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—MEDIUM GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA LANCASTER			PARTICIPANTS											
1974	227438	219209	223971	161223	108821	96642	44508	126101	80129	36078	36048	71816	109977	98262
1985	265702	248769	255091	182901	131025	109877	50603	142557	90517	38449	40984	79836	136587	127948
1995	294299	269820	276024	200055	148478	119724	55138	154094	98290	40339	44658	86428	157336	152647
2005	317667	287051	293651	213140	163308	127897	58902	163282	104659	42189	47706	92100	174544	173944
2015	338461	302357	309861	225157	176835	135177	62255	171526	110417	43850	50422	97246	189844	193830
2025	358421	317862	324540	236762	189286	142408	65585	179975	116145	45464	53119	102044	203659	211176
			ACTIVITY DAYS											
1974	7817	1913	5292	9990	1016	1419	708	2332	866	638	954	602	1451	2047
1985	9566	2183	6024	10142	1294	1613	805	2651	978	751	1022	631	1817	2761
1995	10950	2353	6401	11042	1524	1757	877	2889	1064	874	1080	663	2101	3381
2005	12086	2476	6783	11569	1723	1877	937	3086	1135	979	1151	706	2333	3967
2015	13102	2592	7120	12010	1909	1984	991	3262	1199	1100	1216	741	2537	4545
2025	14023	2715	7473	12377	2072	2090	1044	3436	1262	1206	1275	772	2720	5038
PA LEBANON			PARTICIPANTS											
1974	70577	68327	69808	49596	33733	30556	14059	39313	25207	10934	11427	21882	33789	29743
1985	79815	74747	76619	54496	39381	33480	15404	42858	27459	11252	12521	23606	40957	37967
1995	87763	80364	82193	59167	44356	36159	16637	45925	29557	11708	13523	25384	46996	45246
2005	94018	84733	86664	62499	48548	38290	17618	48219	31189	12119	14320	26807	51915	51596
2015	100109	89106	91029	66003	52648	40370	18575	50601	32846	12594	15098	28286	56498	57865
2025	104969	92721	94668	68610	55891	42132	19385	52515	34202	12863	15757	29327	60156	62665
			ACTIVITY DAYS											
1974	2399	595	1641	3025	309	448	224	732	273	193	292	183	445	607
1985	2863	654	1801	2964	384	491	245	802	297	218	302	184	546	804
1995	3262	699	1898	3202	451	530	265	867	321	252	317	192	629	987
2005	3584	729	1994	3316	510	562	280	918	339	283	334	203	696	1167
2015	3889	762	2089	3440	568	592	296	967	358	325	353	213	757	1357
2025	4130	789	2169	3491	613	618	309	1010	373	353	365	219	806	1497
PA LEHIGH & NORTHAMPTON			PARTICIPANTS											
1974	320388	317505	324708	224327	152459	141225	65118	181447	116110	49372	52704	98673	150875	132051
1985	353408	338133	346897	240190	173175	150639	69458	192577	123143	49461	56217	103545	177544	162725
1995	388305	361804	370336	260226	194905	161930	74664	205344	131924	51187	60430	111085	203839	193715
2005	426268	390134	399344	282153	218033	175194	80780	220696	142359	54393	65380	120478	230812	225713
2015	462426	417373	426739	303736	240455	187872	86626	235648	152512	57570	70112	129779	256352	257283
2025	495645	442821	452370	322953	261074	199866	92156	249440	161947	60129	74588	137738	279859	286006
			ACTIVITY DAYS											
1974	10729	2745	7614	13512	1389	2073	1036	3406	1258	871	1330	828	1998	2696
1985	12425	2940	8133	12880	1665	2211	1105	3633	1336	957	1341	815	2361	3429
1995	14168	3125	8539	13809	1949	2376	1188	3905	1432	1090	1401	847	2717	4185
2005	15956	3338	9171	14723	2247	2571	1285	4225	1548	1240	1513	914	3081	5027
2015	17660	3554	9781	15540	2543	2757	1379	4531	1660	1417	1627	977	3423	5903
2025	19219	3754	10354	16159	2813	2933	1467	4820	1764	1573	1721	1027	3740	6686
PA LUZERNE			PARTICIPANTS											
1974	225176	226226	230887	154673	106915	97542	47199	126259	79647	33134	36060	67073	105343	91377
1985	234030	224663	229919	155634	114952	97076	46974	124912	78779	30903	35868	66169	118511	108290
1995	241854	224917	229647	158460	122142	97628	47241	124614	78956	29957	36092	66726	128836	122865
2005	248233	226056	230839	160723	128259	98356	47593	124919	79404	29760	36361	67718	136978	135620
2015	252193	226496	231022	162036	132360	98797	47807	124895	79660	29462	36524	68301	142464	144423
2025	255109	226974	231307	162898	135430	99212	48007	124942	79886	29197	36677	68560	146408	150863
			ACTIVITY DAYS											
1974	7465	1925	5379	9088	967	1436	751	2460	861	595	896	560	1398	1833
1985	8245	1921	5362	8053	1107	1429	748	2448	851	608	841	513	1581	2245
1995	8898	1911	5274	8101	1231	1437	752	2462	855	660	822	499	1722	2635
2005	9412	1905	5282	8062	1344	1448	758	2481	861	725	830	504	1833	3040
2015	9755	1899	5277	7966	1421	1454	761	2492	865	772	834	504	1908	3322
2025	10002	1897	5281	7865	1478	1460	764	2502	867	810	835	501	1962	3532
PA LYCOMING			PARTICIPANTS											
1974	76415	75427	76941	54038	36283	33531	15465	43210	27650	12106	12514	23923	35853	31297
1985	80687	76296	78085	55179	39726	33991	15677	43534	27848	11488	12686	23950	41112	38000
1995	84896	78321	79669	57248	42971	34906	16099	44382	28510	11400	13027	24603	45417	43876
2005	87831	79114	80789	58334	45631	35538	16390	44826	28934	11372	13263	25051	48727	49038
2015	90164	80215	81820	59369	47588	36137	16667	45339	29376	11361	13487	25478	51101	52635
2025	91777	81014	82574	60003	48960	36588	16874	45692	29691	11315	13655	25709	52753	55117
			ACTIVITY DAYS											
1974	2558	653	1809	3386	329	492	246	809	299	212	323	203	473	638
1985	2877	664	1836	3063	386	499	249	820	301	221	308	189	548	804
1995	3155	675	1842	3150	438	512	256	842	309	248	308	188	607	963
2005	3365	677	1862	3146	484	522	261	857	314	277	313	191	651	1129
2015	3517	682	1981	3136	517	530	265	871	320	298	318	193	683	1242
2025	3622	686	1897	3105	539	537	269	882	323	312	320	193	705	1320
PA MONROE			PARTICIPANTS											
1974	31284	32988	33675	22393	14490	14984	6770	18958	12297	5175	5615	9919	13466	11137
1985	40559	40971	41952	28050	19283	18649	8426	23456	15211	6041	6988	12137	18667	16001
1995	52164	50930	52026	35499	25421	23289	10522	29061	18932	7268	8727	15200	25374	22635
2005	64973	61756	63101	43543	32346	28337	12803	35114	22473	8662	10618	18698	33190	30601
2015	78514	73189	74702	52120	39768	33674	15214	41525	27259	10145	12618	22393	41453	39291
2025	93519	85805	87475	61473	48158	39604	17894	48557	31994	11705	14841	26373	50740	49325
			ACTIVITY DAYS											
1974	976	284	793	1419	123	220	108	354	134	87	141	87	179	221
1985	1327	355	938	1577	170	273	134	441	165	107	166	100	247	319
1995	1786	438	1204	1972	235	341	167	551	206	139	201	121	336	460
2005	2313	526	1455	2350	311	415	204	670	250	170	244	146	442	638
2015	2873	620	1719	2751	395	494	242	796	297	211	290	173	553	842
2025	3500	724	2009	3171	491	580	285	937	349	261	339	201	678	1086

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AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA MONTGOMERY			PARTICIPANTS											
1974	450340	415372	424976	312330	225042	189138	83159	240712	155890	66484	70985	138075	235064	223935
1985	497726	449788	461874	336100	256081	205086	90171	259757	168038	67375	76971	145288	272243	271598
1995	542178	483378	495318	362534	284283	221310	97304	278334	180790	70322	83059	155145	304499	312564
2005	575119	512271	524888	381234	302851	235588	103582	293743	191607	73220	88418	163413	324436	333273
2015	609885	538764	551400	401949	324931	248349	109193	308380	202007	76296	93207	172354	349012	364869
2025	638363	561285	574112	418012	342812	259346	114028	320609	210597	78343	97335	178867	368418	389150
			ACTIVITY DAYS											
1974	16483	3607	9929	18590	2246	2771	1322	4399	1693	1317	1794	1114	3105	4910
1985	18891	3932	10776	17923	2690	3005	1434	4770	1825	1553	1831	1107	3617	6229
1995	21051	4202	11370	19378	3075	3242	1547	5147	1967	1806	1923	1158	4052	7348
2005	22379	4401	12011	20180	3276	3451	1647	5480	2091	1882	2044	1228	4318	7839
2015	24023	4606	12594	21007	3574	3638	1736	5776	2204	2082	2160	1292	4643	8753
2025	25314	4781	13100	21444	3804	3800	1813	6032	2300	2233	2244	1334	4896	9445
PA MONTOUR			PARTICIPANTS											
1974	11562	11653	11861	7979	5528	5193	2440	6567	4229	1729	1933	3471	5400	4687
1985	12743	12288	12541	8512	6290	5489	2579	6898	4441	1708	2044	3626	6422	5854
1995	13914	13000	13242	9164	7045	5827	2738	7277	4703	1744	2169	3861	7363	6987
2005	14988	13709	13975	9722	7765	6164	2896	7646	4960	1801	2295	4091	8225	8093
2015	16013	14431	14702	10314	8424	6499	3053	8037	5226	1876	2419	4343	9004	9085
2025	16208	14455	14710	10341	8640	6533	3069	8026	5240	1837	2432	4337	9282	9529
			ACTIVITY DAYS											
1974	383	99	277	480	50	76	39	127	46	31	47	29	72	94
1985	448	105	293	453	60	81	41	134	48	34	47	28	86	121
1995	510	110	304	482	70	86	44	143	51	38	48	29	98	149
2005	566	115	318	500	80	91	46	151	54	43	51	31	110	160
2015	617	121	334	520	90	95	49	159	57	49	54	32	121	207
2025	634	120	333	510	93	96	49	160	57	51	53	32	124	221
PA NORTHUMBERLAND			PARTICIPANTS											
1974	63171	65233	66512	43896	29744	29294	13656	36913	23849	9628	10930	19062	28433	23978
1985	69301	67724	69233	46476	33796	30474	14207	38187	24668	9397	11371	19764	34054	30347
1995	75919	71330	72760	50169	38155	32201	15011	40128	26010	9632	12015	21135	39564	37045
2005	81052	74284	75789	52736	41793	33658	15690	41634	27105	9863	12558	22224	44099	43013
2015	85031	76632	78097	54903	44605	34799	16223	42872	27998	10072	12984	23177	47630	47726
2025	88340	78735	80163	56618	46972	35842	16709	43961	28791	10216	13373	23864	50437	51545
			ACTIVITY DAYS											
1974	2030	555	1548	2676	260	430	217	710	259	169	263	162	380	471
1985	2380	579	1612	2489	315	447	226	739	268	179	259	156	454	615
1995	2744	608	1670	2639	374	473	239	781	283	206	267	160	528	780
2005	3037	626	1733	2708	428	494	250	816	295	232	278	167	589	948
2015	3266	643	1783	2757	471	511	258	844	305	254	289	172	638	1082
2025	3448	659	1830	2782	506	526	264	869	314	275	296	175	676	1194
PA PHILADELPHIA & DELAWARE			PARTICIPANTS											
1974	1610776	1551865	1606896	1125274	764407	626351	251880	868845	520663	247460	227738	496488	783612	709246
1985	1733396	1622344	1687067	1178797	846167	655727	263693	905353	541842	244496	238419	510190	891453	841705
1995	1792048	1641076	1702775	1202536	894445	666360	267969	912422	548529	238443	242285	514580	956689	932516
2005	1823898	1644490	1706501	1207829	927066	670465	269619	910523	549956	234810	243777	516737	1000375	999256
2015	1835888	1635144	1695068	1206804	946847	668219	268716	903525	547470	230908	242961	516170	1027034	1048385
2025	1826528	1612784	1670447	1192381	952103	660708	265696	889263	540372	224714	240230	509025	1036203	1072715
			ACTIVITY DAYS											
1974	55532	13380	37966	67467	7329	9264	3969	15146	5552	4485	6341	4077	9483	14933
1985	62325	14073	39851	63445	8525	9698	4155	15856	5778	4914	6280	3951	10925	18324
1995	66473	14149	39495	64154	9326	9856	4223	16113	5861	5314	6171	3859	11806	20758
2005	69151	14018	39396	63443	9911	9916	4249	16212	5891	5581	6189	3868	12387	22825
2015	70773	13874	39051	62265	10340	9883	4234	16158	5869	5890	6174	3838	12740	24542
2025	71227	13630	38423	60440	10540	9772	4187	15976	5798	6039	6074	3755	12867	25481
PA PIKE			PARTICIPANTS											
1974	8531	8586	8723	5801	4158	3991	1811	4864	3218	1224	1497	2495	4052	3553
1985	11934	11521	11727	7849	5909	5378	2441	6496	4306	1527	2017	3300	6083	5585
1995	15071	14112	14322	9731	7775	6630	3008	7916	5283	1773	2487	4030	8058	7678
2005	18915	17361	17619	12002	9967	8197	3720	9688	6504	2108	3075	4952	10465	10280
2015	23542	21299	21586	14791	12598	10093	4580	11850	7991	2530	3786	6094	13345	13407
2025	28833	25813	26121	17924	15630	12285	5575	14308	9696	2975	4609	7368	16646	16995
			ACTIVITY DAYS											
1974	286	72	203	342	37	58	29	94	35	23	34	21	56	71
1985	422	97	273	410	57	79	39	127	47	31	43	25	81	115
1995	555	118	326	500	77	97	48	157	58	41	51	30	108	162
2005	717	143	397	604	102	120	59	194	71	53	62	36	140	224
2015	910	174	484	726	132	148	73	239	88	69	76	44	179	300
2025	1132	210	583	859	166	180	89	290	107	87	91	52	223	386
PA SCHUYLKILL			PARTICIPANTS											
1974	111799	104809	106869	74952	55773	45613	21984	58496	37143	15146	16890	32378	58321	54846
1985	106966	108714	111143	72011	50986	47409	22850	60455	38376	14744	17555	30445	49796	42947
1995	114497	113708	116076	76213	55398	49798	24002	63028	40168	15195	18440	32089	55406	48658
2005	123092	119097	121540	80171	60870	52508	25307	65577	42100	15283	19443	33610	62255	56190
2015	132685	124631	127243	85413	67110	55197	26604	68563	44182	15821	20439	35826	70016	65537
2025	145136	130154	132548	91591	77011	57739	27829	71283	46103	16247	21380	38293	82855	84072
			ACTIVITY DAYS											
1974	4057	888	2476	4213	553	671	350	1144	402	306	412	257	779	1171
1985	3512	926	2576	3904	457	697	366	1189	416	277	404	246	663	850
1995	3878	962	2675	4128	508	733	382	1249	435	288	417	254	739	960
2005	4315	991	2769	4226	576	772	403	1317	450	300	430	261	831	1127
2015	4823	1032	2893	4380	660	812	423	1384	481	335	452	273	939	1365
2025	5649	1070	3015	4479	826	849	443	1448	502	434	470	282	1111	1923

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(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA SNYDER			PARTICIPANTS											
1974	20084	20707	21171	14924	9699	9325	4229	12034	7740	3482	3498	6719	9434	8141
1985	24610	23527	24147	17138	11959	10611	4812	13624	8752	3717	3980	7596	12220	11149
1995	28365	26264	26887	19429	14197	11906	5399	15153	9784	4001	4466	8464	14859	14191
2005	31309	28384	29053	21118	16087	12923	5860	16311	10585	4256	4847	9193	17050	16958
2015	34875	31200	31898	23326	18209	14245	6460	17888	11651	4615	5343	10154	19444	19807
2025	37305	33265	33990	24917	19805	15219	6901	19039	12429	4859	5708	10826	21235	21983
			ACTIVITY DAYS											
1974	678	181	505	945	87	137	67	220	84	59	93	58	125	169
1985	860	207	576	957	114	155	77	251	95	68	100	61	163	238
1995	1037	230	628	1074	143	174	86	281	106	83	109	66	199	312
2005	1183	246	676	1146	168	189	93	305	115	97	118	72	228	390
2015	1344	268	740	1241	195	209	103	337	127	113	130	78	260	466
2025	1464	285	787	1302	216	223	110	360	135	126	138	83	284	526
PA SULLIVAN			PARTICIPANTS											
1974	3715	3889	3954	2655	1763	1796	808	2235	1467	610	674	1179	1675	1448
1985	3881	3865	3943	2667	1904	1788	804	2212	1452	569	671	1155	1881	1711
1995	4054	3880	3947	2730	2048	1805	812	2212	1459	549	678	1164	2079	1971
2005	4175	3894	3962	2762	2155	1821	819	2210	1467	536	684	1177	2231	2175
2015	4277	3910	3972	2799	2245	1834	825	2212	1475	529	689	1193	2362	2358
2025	4344	3918	3977	2815	2313	1844	830	2211	1479	520	693	1197	2453	2497
			ACTIVITY DAYS											
1974	121	33	93	174	16	26	13	42	16	10	17	10	23	29
1985	133	33	93	154	18	26	13	42	16	11	16	9	25	36
1995	145	33	91	155	20	26	13	42	16	12	15	9	28	43
2005	155	33	90	153	22	27	13	43	16	12	15	9	30	48
2015	163	33	90	151	23	27	13	43	16	13	15	9	32	53
2025	168	33	90	148	25	27	13	43	16	14	15	9	33	58
PA SUSQUEHANNA			PARTICIPANTS											
1974	23762	24087	24554	17008	11181	10765	4978	13835	8878	3898	4024	7550	10845	9364
1985	27129	26352	26953	18767	13178	11800	5456	15079	9671	4010	4411	8154	13335	12086
1995	31820	29924	30530	21436	15947	13530	6256	16981	11005	4293	5057	9207	16524	15588
2005	36025	33176	33849	24103	18396	15030	6935	18826	12202	4760	5607	10340	19338	18866
2015	40409	36632	37327	26792	20984	16612	7681	20738	13493	5182	6209	11499	22291	22301
2025	44612	40004	40731	29319	23469	18192	8411	22591	14746	5562	6800	12554	25077	25545
			ACTIVITY DAYS											
1974	780	209	577	1099	100	158	79	259	96	67	103	65	145	191
1985	940	230	634	1078	125	173	87	284	105	76	107	66	178	253
1995	1152	256	701	1204	157	198	100	325	120	89	118	72	221	334
2005	1342	284	777	1334	188	220	110	361	133	107	131	80	259	420
2015	1540	311	855	1452	221	244	122	400	147	125	145	88	299	509
2025	1727	338	931	1552	252	267	134	438	161	142	158	95	337	594
PA UNION			PARTICIPANTS											
1974	19918	19743	20234	14293	9386	8903	3957	11499	7391	3309	3340	6436	9242	8073
1985	22811	21735	22352	15844	11095	9817	4363	12615	8101	3424	3683	6976	11339	10392
1995	25761	23833	24451	17623	12866	10813	4806	13786	8894	3624	4057	7672	13421	12793
2005	28492	25853	26488	19160	14579	11815	5251	14868	9667	3838	4433	8329	15400	15151
2015	31351	28071	28763	21018	16249	12818	5697	16150	10501	4177	4809	9168	17328	17455
2025	33944	30135	30858	22597	17806	13791	6129	17304	11280	4419	5175	9836	19076	19552
			ACTIVITY DAYS											
1974	661	174	485	874	86	130	63	208	80	57	89	55	122	170
1985	797	192	535	860	107	144	69	230	88	65	93	56	150	225
1995	937	210	574	944	129	158	76	253	96	76	99	60	177	283
2005	1067	224	619	1009	151	173	84	276	105	87	107	64	204	345
2015	1197	243	672	1091	172	188	[illegible]	[illegible]	116	99	117	70	230	407
2025	1315	260	719	1151	192	202	[illegible]	325	123	111	125	75	254	464
PA WAYNE			PARTICIPANTS											
1974	20800	21321	21697	14511	9897	9698	4435	12125	7893	3199	3628	6317	9522	8185
1985	24360	23706	24186	16380	11997	10815	4946	13624	8745	3327	4046	6966	12098	10948
1995	28906	27101	27608	19141	14638	12396	5669	15311	10001	3681	4637	8049	15158	14350
2005	34083	31213	31853	22287	17634	14289	6534	17602	11516	4203	5345	9397	18571	18237
2015	39222	35330	36022	25427	20631	16212	7413	19883	13050	4692	6064	10733	21988	22141
2025	44191	39382	40153	28460	23521	18090	8272	22138	14551	5173	6766	12002	25208	25860
			ACTIVITY DAYS											
1974	679	182	506	903	88	142	71	232	86	57	87	54	127	164
1985	846	203	564	899	113	159	79	258	95	66	91	55	161	226
1995	1052	231	632	1032	145	182	90	296	109	81	102	61	202	306
2005	1281	264	727	1172	181	210	104	341	126	100	118	71	248	405
2015	1510	297	820	1304	218	238	118	387	142	120	134	80	294	505
2025	1726	331	913	1425	254	265	132	432	159	140	149	88	337	602
PA WYOMING			PARTICIPANTS											
1974	13448	13664	13939	9656	6315	6188	2818	7899	5104	2229	2321	4297	6102	5229
1985	15132	14718	15066	10495	7341	6677	3040	8478	5474	2257	2504	4571	7400	6677
1995	17141	16133	16480	11709	8541	7346	3345	9267	6006	2398	2755	5042	8820	8301
2005	19018	17516	17887	12776	9725	8020	3652	10012	6528	2546	3007	5498	10201	9948
2015	20221	18288	18653	13443	10518	8397	3824	10429	6827	2623	3149	5788	11164	11189
2025	21269	19019	19386	14020	11211	8753	3986	10823	7104	2687	3282	6025	11973	12232
			ACTIVITY DAYS											
[illegible]	439	119	330	619	56	91	45	147	55	38	59	37	82	106
[illegible]	522	129	356	596	69	98	48	158	59	42	61	37	99	140
[illegible]	617	140	383	658	84	108	53	174	65	50	65	39	110	179
[illegible]	708	151	414	699	99	118	58	190	71	57	70	43	136	222
[illegible]	771	156	431	719	111	123	61	199	74	63	74	44	150	257
[illegible]	826	162	447	732	120	128	63	207	77	69	76	46	161	286

[illegible]

TABLE 4.A.7——PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP——MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS, PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA MONTGOMERY			PARTICIPANTS											
1974	450340	415372	424976	312330	225042	189138	83159	240712	155890	66484	70985	138075	235064	223935
1985	497726	449788	461874	336100	256081	205086	90171	259757	168038	67375	76971	145288	272243	271598
1995	542178	483378	495318	362534	284283	221310	97304	278334	180790	70322	83059	155145	304499	312564
2005	575119	512271	524808	381234	302851	235588	103582	293743	191607	73220	88418	163413	324436	333273
2015	609885	538764	551400	401949	324931	248349	109193	308380	202007	76296	93207	172354	349012	364869
2025	638363	561285	574112	418012	342812	259346	114028	320609	210597	78343	97335	178867	368418	389150
			ACTIVITY DAYS											
1974	16483	3607	9929	18590	2246	2771	1322	4399	1693	1317	1794	1114	3105	4910
1985	18891	3932	10776	17923	2690	3005	1434	4770	1825	1553	1831	1107	3617	6229
1995	21051	4202	11370	19378	3075	3242	1547	5147	1967	1806	1923	1158	4052	7340
2005	22379	4401	12011	20180	3276	3451	1647	5480	2091	1802	2044	1228	4310	7835
2015	24023	4606	12594	21007	3574	3638	1736	5776	2204	2082	2160	1292	4643	8753
2025	25314	4781	13100	21444	3804	3800	1813	6032	2300	2233	2244	1334	4896	9445
PA MONTOUR			PARTICIPANTS											
1974	11562	11653	11861	7979	5528	5193	2440	6567	4229	1729	1933	3471	5400	4687
1985	12743	12288	12541	8512	6290	5489	2579	6898	4441	1708	2044	3626	6422	5854
1995	13914	13000	13242	9164	7045	5827	2738	7277	4703	1744	2169	3861	7363	6987
2005	14988	13709	13975	9722	7765	6164	2896	7646	4960	1801	2295	4091	8225	8093
2015	16013	14431	14702	10314	8424	6499	3053	8037	5226	1876	2419	4343	9004	9089
2025	16208	14455	14710	10341	8640	6533	3069	8026	5240	1837	2432	4337	9282	9529
			ACTIVITY DAYS											
1974	383	99	277	480	50	76	39	127	46	31	47	29	72	96
1985	448	105	293	453	60	81	41	136	48	34	47	28	86	121
1995	510	110	304	482	70	86	44	143	51	38	48	29	98	149
2005	566	115	318	500	80	91	46	151	54	43	51	31	110	180
2015	617	121	334	520	90	95	49	159	57	49	54	32	121	207
2025	634	120	333	510	93	96	49	160	57	51	53	32	124	221
PA NORTHUMBERLAND			PARTICIPANTS											
1974	63171	65233	66512	43896	29744	29294	13656	36913	23849	9628	10930	19062	28433	23978
1985	69301	67724	69233	46476	33796	30474	14207	38187	24668	9397	11371	19764	34054	30347
1995	75919	71330	72760	50169	38155	32201	15011	40128	26010	9632	12015	21135	39564	37045
2005	81052	74284	75789	52736	41793	33658	15690	41634	27105	9863	12558	22224	44099	43013
2015	85031	76632	78097	54903	44605	34799	16223	42872	27998	10072	12984	23177	47630	47726
2025	88340	78735	80163	56618	46972	35842	16709	43961	28791	10214	13373	23864	50437	51545
			ACTIVITY DAYS											
1974	2030	555	1548	2676	260	430	217	710	259	169	263	162	380	471
1985	2380	579	1612	2489	315	447	226	739	268	179	259	156	454	615
1995	2744	608	1670	2639	374	473	239	781	283	206	267	160	528	780
2005	3037	626	1733	2708	428	494	250	816	295	232	278	167	589	948
2015	3266	643	1783	2757	471	511	258	844	305	254	289	172	638	1082
2025	3448	659	1830	2782	506	526	266	869	314	275	296	175	676	1194
PA PHILADELPHIA & DELAWARE			PARTICIPANTS											
1974	1610776	1551865	1636496	1125274	764407	626351	251880	868845	520663	247460	227738	494488	783812	709246
1985	1733396	1622344	1687067	1178797	846167	655727	263693	905353	541842	244496	238419	510190	891453	841705
1995	1792048	1641076	1702775	1202516	894445	666360	267969	912422	548529	238443	242285	514580	956689	932516
2005	1823898	1644490	1706501	1207829	927066	670465	269619	910523	549956	234810	243777	516737	1000375	999256
2015	1835888	1635144	1695068	1206804	946847	668219	268716	903525	547470	230908	242961	516170	1027034	1048385
2025	1826528	1612784	1670447	1192381	952103	660708	265696	889263	540372	224714	240230	509025	1036203	1072715
			ACTIVITY DAYS											
1974	55532	13380	37966	67467	7329	9264	3969	15146	5552	4485	6341	4077	9483	14933
1985	62325	14073	39851	63445	8525	9698	4155	15656	5778	4916	6280	3951	10925	18324
1995	66473	14149	39495	64154	9326	9856	4223	16113	5861	5314	6171	3859	11806	20758
2005	69151	14018	39396	63443	9911	9916	4249	16212	5891	5581	6189	3868	12387	22825
2015	70773	13874	39051	62265	10340	9883	4234	16158	5869	5890	6174	3838	12740	24542
2025	71227	13630	38423	60440	10540	9772	4187	15976	5798	6039	6074	3755	12867	25481
PA PIKE			PARTICIPANTS											
1974	8531	8584	8723	5801	4158	3991	1811	4864	3218	1224	1497	2495	4052	3553
1985	11934	11521	11727	7849	5999	5378	2441	6496	4306	1527	2017	3300	6083	5585
1995	15071	14112	14322	9731	7775	6630	3008	7916	5283	1773	2487	4030	8058	7678
2005	18915	17361	17619	12002	9967	8197	3720	9688	6504	2108	3075	4952	10465	10280
2015	23542	21299	21586	14791	12598	10093	4580	11850	7991	2530	3786	6094	13345	13407
2025	28833	25813	26121	17924	15630	12285	5575	14308	9696	2975	4609	7348	16646	16995
			ACTIVITY DAYS											
1974	286	72	203	342	37	58	29	94	35	23	34	21	54	71
1985	422	97	273	410	57	79	39	127	47	31	43	25	81	115
1995	555	118	326	500	77	97	48	157	58	41	51	30	100	162
2005	717	143	397	604	102	120	59	194	71	53	62	36	140	224
2015	910	174	484	726	132	148	73	239	88	69	76	44	179	300
2025	1132	210	583	859	166	180	89	290	107	87	91	52	223	386
PA SCHUYLKILL			PARTICIPANTS											
1974	111799	104809	106869	74952	55773	45613	21984	58496	37143	15146	16890	32378	58321	54846
1985	106966	108714	111143	72011	50986	47409	22850	60455	38376	14744	17555	30445	49796	42947
1995	114497	113708	116076	76213	55398	49798	24002	63028	40168	15195	18440	32089	55406	48658
2005	123092	119097	121540	80171	60870	52508	25307	65577	42100	15283	19443	33610	62255	56190
2015	132685	124831	127243	85413	67110	55197	26604	68563	44182	15821	20439	35826	70016	65537
2025	145136	130154	132548	91591	77011	57739	27829	71283	46103	16247	21380	38293	82855	84072
			ACTIVITY DAYS											
1974	4057	888	2476	4213	553	671	350	1144	402	306	412	257	779	1171
1985	3512	926	2576	3904	457	697	364	1189	416	277	406	246	663	850
1995	3878	962	2675	4128	506	733	382	1249	435	288	417	254	739	960
2005	4315	991	2769	4226	576	772	403	1317	458	300	430	261	831	1127
2015	4823	1032	2893	4380	660	812	423	1386	481	335	452	273	939	1365
2025	5649	1070	3015	4479	826	849	443	1448	502	434	470	282	1111	1923

IDE ASSOCIATES, INC.

TABLE 4.A.7—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA YORK			PARTICIPANTS											
1974	193506	185726	189921	135676	93368	83353	37542	107009	68729	29732	31185	59934	94341	84469
1985	224812	209467	214968	153414	111819	94080	42373	120336	77171	31583	35198	66516	116740	109951
1995	253626	231569	237110	170913	129112	104500	47067	132571	85414	33794	39097	73367	136993	133780
2005	280310	252346	258393	186273	145536	114407	51529	143833	93156	36164	42803	79900	155623	156256
2015	303739	270574	276731	200672	160005	122859	55336	154038	100025	38403	45966	86055	171492	176530
2025	322406	285164	291439	211438	171640	129822	58472	161982	105498	39847	48570	90470	184467	192600
			ACTIVITY DAYS											
1974	6683	1614	4465	8224	870	1222	597	1976	745	532	795	496	1239	1747
1985	8154	1833	5051	8312	1108	1380	674	2230	836	628	849	517	1549	2370
1995	9508	2013	5477	9231	1332	1532	749	2477	927	750	916	555	1827	2969
2005	10744	2168	5948	9906	1543	1678	820	2712	1013	866	998	604	2077	3578
2015	11818	2318	6353	10480	1735	1802	880	2912	1089	1003	1076	647	2285	4170
2025	12679	2433	6682	10816	1887	1904	930	3078	1149	1098	1130	675	2457	4619
NJ TOTAL			PARTICIPANTS											
1974	4738120	4451925	4578299	3309918	2317902	1949763	840568	2558612	1614234	717290	725349	1462764	2400908	2241996
1985	5619145	5148315	5310871	3825273	2833048	2263767	975685	2952807	1863833	782874	842766	1657054	2998339	2934949
1995	6311261	5687487	5854369	4250335	3247179	2515841	1085058	3254589	2064798	838272	937090	1821182	3469409	3499111
2005	6921746	6160032	6339468	4602652	3625126	2740445	1182432	3512168	2241345	891687	1021102	1971117	3894857	4021486
2015	7452063	6584570	6768996	4924526	3941210	2939829	1268769	3747570	2401230	941168	1095678	2108986	4243091	4438611
2025	7877785	6928085	7117378	5175705	4194414	3102270	1339186	3936101	2529908	976210	1156416	2213949	4523751	4768632
			ACTIVITY DAYS											
1974	169232	38799	107464	197912	22753	28642	13337	45948	17427	13661	18913	11892	31012	48482
1985	208903	45173	124612	205991	29312	33247	15482	53247	20132	17104	20763	12741	39036	66323
1995	240666	49657	134981	228583	34640	36943	17220	59119	22347	20416	22383	13658	45316	81015
2005	268497	53196	145620	243388	39562	40237	18767	64354	24313	23283	24288	14783	50943	95492
2015	292419	56582	155113	256196	43530	43162	20138	68999	26077	25754	26047	15757	55502	106915
2025	311168	59315	162837	264355	46670	45544	21256	72789	27498	27559	27356	16444	59200	115717
NJ BERGEN			PARTICIPANTS											
1974	648731	596424	610976	444655	326471	270882	120355	343958	222528	92461	101568	195132	343294	330360
1985	725674	655960	674194	486151	374750	298103	132449	377305	243718	95862	111776	208936	398888	399928
1995	788644	704245	722534	523366	414430	321194	142709	403985	261886	99805	120433	222617	443798	456944
2005	848413	751663	770921	557694	451417	344153	152910	429680	279344	105101	129041	237385	484778	507107
2015	900646	794108	813515	589534	482474	364385	161899	453179	296058	110044	136627	251157	518505	547369
2025	950509	835372	855313	618479	511904	384224	170713	475729	311628	113838	144066	262963	550739	584548
			ACTIVITY DAYS											
1974	23975	5163	14205	25605	3301	3970	1914	6346	2418	1882	2513	1552	4560	7287
1985	27626	5720	15662	25294	3957	4369	2107	6984	2649	2262	2620	1579	5314	9208
1995	30638	6111	16515	27214	4494	4707	2270	7525	2851	2621	2748	1647	5918	10772
2005	33368	6456	17574	28718	4969	5043	2432	8063	3052	2900	2946	1764	6463	12167
2015	35642	6790	18510	30030	5353	5340	2575	8537	3231	3144	3128	1864	6907	13273
2025	37792	7118	19432	30871	5709	5631	2715	9002	3404	3343	3275	1939	7335	14244
NJ ESSEX			PARTICIPANTS											
1974	577736	550180	571600	403471	277588	225479	86389	310632	187495	88163	82315	177871	286525	265708
1985	648987	600909	626265	441139	320491	246607	94464	336167	203865	90942	90028	190706	338901	326891
1995	671419	608880	633378	450266	338648	250989	96162	341417	206672	88734	91628	192202	362812	360218
2005	689687	616940	641805	456379	353701	255380	97845	344472	209520	88059	93231	194623	381682	387050
2015	703743	623620	648154	461642	365164	259010	99236	347172	211985	87455	94556	196539	395703	407159
2025	717157	630979	655265	467561	375263	262694	100647	350530	214673	87294	95901	198900	407904	424074
			ACTIVITY DAYS											
1974	20262	4763	13462	24057	2725	3331	1359	5295	2003	1679	2264	1445	3450	5754
1985	23661	5234	14763	23587	3293	3643	1487	5792	2178	1934	2344	1462	4125	7306
1995	25190	5272	14649	23883	3588	3708	1513	5895	2213	2091	2302	1427	4441	8204
2005	26371	5285	14783	23685	3828	3773	1540	5998	2248	2206	2329	1440	4686	9009
2015	27253	5310	14889	23479	4010	3826	1561	6083	2278	2308	2349	1443	4866	9615
2025	28031	5349	15017	23390	4164	3881	1584	6169	2308	2395	2375	1451	5023	10116
NJ HUDSON			PARTICIPANTS											
1974	413949	402006	413769	286090	194843	153370	76398	219332	127690	61751	55058	125132	201348	181217
1985	434324	408005	421081	291902	211036	155941	77679	221802	129009	59111	55981	125263	224814	212085
1995	459604	421678	434206	304692	228854	161945	80670	228308	133419	59003	58137	129373	247621	241827
2005	484372	437041	450088	317152	246108	168359	83865	235810	138319	60127	60439	134576	268570	270104
2015	503717	449125	461991	327649	259646	173409	86380	241857	142309	61199	62252	139023	284716	292417
2025	520328	460188	473029	335918	271101	178141	88737	247199	145883	61699	63951	142240	298253	310501
			ACTIVITY DAYS											
1974	14220	3470	9748	16535	1876	2277	1212	4179	1353	1131	1562	1025	2585	3789
1985	15653	3540	9919	15075	2145	2315	1232	4249	1367	1209	1499	964	2911	4599
1995	17134	3633	10055	15624	2413	2404	1280	4413	1417	1346	1507	965	3218	5380
2005	18495	3733	10379	15921	2671	2499	1331	4588	1472	1491	1563	999	3496	6210
2015	19553	3819	10634	16195	2876	2574	1370	4725	1516	1625	1612	1026	3709	6880
2025	20430	3898	10874	16227	3043	2645	1408	4854	1555	1724	1645	1040	3887	7407
NJ HUNTERDON			PARTICIPANTS											
1974	53176	49913	51000	37281	26205	22828	10133	29028	18833	8078	8581	16474	26974	25104
1985	71705	65529	67191	48864	36514	30015	13323	37976	24620	9951	11283	21154	38527	37809
1995	93089	83630	85570	62767	48427	38454	17069	48334	31457	12339	14455	26902	51630	52381
2005	110894	98542	100822	73848	58685	45501	20197	56728	37106	14291	17104	31636	62770	65220
2015	127204	112258	114724	84262	67932	51953	23062	64507	42331	16115	19529	36132	72838	76648
2025	143136	125798	128474	94213	76936	58373	25911	72126	47475	17776	21942	40347	82625	87547
			ACTIVITY DAYS											
1974	1903	436	1192	2280	254	334	161	531	205	153	216	134	358	538
1985	2683	575	1570	2671	377	440	212	698	267	219	268	163	515	852
1995	3579	731	1967	3427	517	563	272	895	342	305	335	202	691	1216
2005	4335	851	2309	3967	640	666	321	1059	405	381	396	238	839	1557
2015	5020	965	2623	4461	750	761	367	1209	462	449	493	271	973	1856
2025	5684	1077	2935	4886	856	855	412	1358	518	510	906	301	1104	2133

TOE ASSOCIATES, INC.

TABLE 4.A.7 ---PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP---MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ MERCER			PARTICIPANTS											
1974	221615	208347	215027	154449	108117	91704	37346	120018	75851	33542	34123	68606	111624	103454
1985	261351	239007	247546	177399	131517	105262	42868	137311	86614	36343	39168	76970	139125	135567
1995	302376	271369	280444	202617	155616	120081	48903	155367	98440	39759	44682	86827	166488	167655
2005	342982	304003	314165	226706	179744	135168	55047	173248	110369	43658	50296	96994	193347	199398
2015	381219	335311	344219	250191	201847	149484	60877	190647	121882	47444	55623	107030	217676	227619
2025	398539	348752	359864	259925	212561	155862	63475	197866	126852	48550	57996	110940	229700	242228
			ACTIVITY DAYS											
1974	7863	1811	5075	9075	1053	1347	591	2107	819	628	892	556	1410	2228
1985	9683	2093	5840	9364	1356	1546	679	2418	935	783	969	591	1774	3057
1995	11529	2362	6489	10651	1660	1764	774	2758	1065	965	1069	647	2131	3878
2005	13330	2614	7237	11741	1961	1985	871	3105	1197	1140	1196	723	2478	4731
2015	14971	2867	7456	12695	2231	2196	964	3434	1323	1302	1322	795	2791	5482
2025	15767	2971	8249	12956	2369	2289	1005	'3580	1378	1381	1368	817	2946	5879
NJ MIDDLESEX			PARTICIPANTS											
1974	428860	398286	409198	305062	209570	178226	77965	233261	148698	67521	66842	136597	218233	204230
1985	513960	466838	481649	356443	259378	208826	91351	272774	173422	74693	78318	156329	275548	272688
1995	598443	535785	551556	410711	308483	240645	105270	312156	199267	83066	90251	178172	330394	338048
2005	659466	584893	601949	446476	345767	264151	115553	339113	217799	88873	99067	193485	371366	388151
2015	712188	628436	646080	479636	376376	284483	124447	363677	234328	94404	106693	207860	404285	427208
2025	750918	660384	678647	502692	399014	299617	131068	381386	246385	97652	112368	217531	429095	456020
			ACTIVITY DAYS											
1974	15436	3530	9633	18634	2061	2612	1239	4143	1609	1242	1777	1119	2874	4433
1985	19274	4175	11325	19598	2713	3060	1452	4855	1876	1616	1972	1214	3654	6267
1995	23010	4765	12719	22617	3338	3526	1673	5594	2160	2030	2209	1353	4391	8000
2005	25754	5135	13832	24228	3814	3871	1837	6141	2366	2322	2412	1474	4932	9402
2015	27993	5492	14806	25680	4189	4169	1978	6613	2548	2573	2601	1581	5361	10480
2025	29656	5750	15523	26386	4465	4391	2084	6965	2682	2731	2724	1645	5689	11246
NJ MONMOUTH			PARTICIPANTS											
1974	336710	316199	324270	238002	165265	142198	60532	184007	117859	52497	53254	105704	170346	159705
1985	415007	379482	390989	285181	209868	171078	72826	220300	140963	59243	64070	123984	221200	217149
1995	483716	435340	446782	328748	249680	196739	83749	251544	161607	65868	73681	141404	265958	269058
2005	543505	483152	496177	364786	285163	219415	93402	278250	179674	71849	82173	156962	305344	315669
2015	595821	525811	539455	396918	315722	239498	101951	302053	195791	76929	89694	170713	338930	354866
2025	638032	560360	574562	422496	340393	255821	108899	321264	208798	80855	95807	181473	366149	386372
			ACTIVITY DAYS											
1974	12045	2770	7622	14772	1621	2085	961	3277	1275	1008	1381	867	2215	3488
1985	15447	3350	9186	15879	2169	2508	1156	3942	1526	1301	1568	960	2893	4932
1995	18488	3815	10315	18313	2663	2884	1330	4533	1752	1606	1753	1068	3487	6259
2005	21134	4190	11417	19934	3106	3217	1483	5056	1952	1865	1953	1187	4005	7515
2015	23399	4534	12377	21263	3480	3511	1619	5519	2130	2091	2128	1284	4444	8561
2025	25228	4815	13170	22217	3781	3750	1729	5895	2273	2267	2262	1356	4802	9391
NJ MORRIS			PARTICIPANTS											
1974	282837	258988	265580	199299	141092	118160	51767	152137	98135	43216	44486	88480	148320	142706
1985	340279	305588	314553	233715	175227	139506	61119	178993	115281	47997	52522	101576	186833	189569
1995	419197	372119	382221	285361	219743	170510	74702	217405	140529	56741	64194	122657	235488	245505
2005	485957	428404	440458	327038	257753	197502	86528	249477	162177	64162	74357	140541	276362	291948
2015	533802	469513	481689	357354	284697	216787	94977	272491	177776	69309	81617	153722	305530	324658
2025	564896	495889	508549	376176	302374	229442	100521	287249	187874	72027	86381	161619	324719	346075
			ACTIVITY DAYS											
1974	10434	2295	6226	12053	1427	1729	824	2722	1064	857	1139	712	1973	3172
1985	13015	2727	7362	12749	1874	2042	972	3214	1251	1135	1274	777	2495	4459
1995	16355	3305	8785	15624	2413	2496	1188	3928	1527	1495	1514	919	3146	5910
2005	19133	3764	10090	17656	2861	2891	1376	4550	1766	1768	1749	1058	3687	7134
2015	21117	4098	11009	18997	3177	3173	1511	4994	1938	1955	1921	1155	4076	7981
2025	22408	4314	11599	19601	3384	3358	1599	5285	2050	2068	2022	1208	4332	8527
NJ OCEAN			PARTICIPANTS											
1974	171162	167847	170930	117879	83584	77355	34344	95933	62844	25380	29006	51167	83210	74308
1985	269337	253665	258925	179742	136080	117234	52049	144397	94668	36078	43959	76484	140566	132383
1995	335547	307466	313174	220720	173880	142680	63347	174447	114868	42229	53500	92939	182903	179168
2005	385753	346992	353571	249701	204356	161725	71802	196028	129717	46528	60642	104923	217313	219780
2015	422072	375310	382107	270940	226599	175377	77863	211543	140447	49527	65761	113724	242350	249860
2025	441775	389800	396611	281569	239465	182578	81060	219234	146001	50651	68461	118135	257014	268402
			ACTIVITY DAYS											
1974	5872	1432	4019	7123	772	1134	546	1811	683	471	687	421	1098	1520
1985	9759	2173	6096	9665	1338	1718	828	2745	1029	758	985	588	1863	2831
1995	12621	2618	7253	11694	1782	2091	1008	3341	1251	1001	1166	690	2429	3960
2005	14909	2922	8157	12865	2165	2370	1142	3787	1416	1208	1311	773	2890	5032
2015	16575	3145	8797	13636	2449	2570	1238	4107	1534	1373	1417	830	3224	5841
2025	17536	3252	9122	13830	2622	2676	1289	4275	1596	1471	1473	857	3420	6363
NJ PASSAIC			PARTICIPANTS											
1974	321153	304772	313759	222340	196168	131818	57435	173510	108726	47747	48847	97522	160879	148076
1985	359752	332420	342767	243378	180008	144102	62787	188632	118288	49583	53399	105180	189929	182001
1995	390702	354579	365252	260446	199817	154357	67256	200672	126140	50875	57200	111005	213447	212099
2005	415556	372339	383531	274554	215758	162438	70777	210033	132564	52800	60194	117137	231999	235870
2015	436872	389519	400812	287712	230837	170407	74249	219198	138852	54425	63147	122639	248926	257873
2025	460898	406428	417907	300029	244614	178270	77675	228188	144983	55891	66061	127636	264453	277035
			ACTIVITY DAYS											
1974	11330	2641	7367	13029	1511	1939	911	3151	1172	895	1258	791	2068	3146
1985	13225	2889	8043	13042	1833	2119	996	3445	1276	1043	1318	812	2468	4042
1995	14776	3067	8446	13722	2105	2270	1067	3690	1363	1198	1357	830	2775	4812
2005	16003	3199	8838	14219	2327	2389	1123	3883	1434	1327	1432	874	3020	5492
2015	17125	3328	9211	14618	2533	2506	1178	4074	1504	1463	1501	910	3239	6134
2025	18151	3458	9591	14925	2713	2622	1232	4262	1572	1570	1561	948	3442	6605

IBE ASSOCIATES, INC.

TABLE 4.A.7 ---PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP---MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ PHILADELPHIA SMSA-NJ			PARTICIPANTS											
1974	624254	587649	604329	445981	302320	261968	110276	343457	218417	100340	98041	199913	310565	286724
1985	800498	732615	756521	554828	401090	327013	137657	426634	270935	117195	122384	243282	423325	412637
1995	913531	820874	845890	626841	467840	367654	154764	476931	303897	127948	137594	272197	499505	504000
2005	1022043	907559	934698	691650	533300	408626	172011	524839	336390	138638	152927	299898	572007	591520
2015	1127108	994305	1023186	758058	593593	446837	188938	573790	369057	149987	167976	328794	637672	667791
2025	1230728	1080728	1111363	823032	652502	488994	205843	622420	401486	160906	183005	356781	702194	741088
			ACTIVITY DAYS											
1974	22053	5181	14276	27894	2923	3841	1750	6017	2360	1830	2629	1661	4003	6189
1985	29636	6503	17845	30973	4128	4795	2184	7511	2929	2464	3088	1903	5510	9343
1995	34803	7254	19609	35040	4993	5391	2456	8444	3290	3016	3386	2079	6523	11768
2005	39671	7921	21574	38106	5823	5992	2730	9385	3651	3521	3741	2292	7472	14154
2015	44133	8633	23549	41097	6555	6581	2998	10309	4009	3984	4116	2506	8324	16204
2025	48504	9345	25542	43861	7260	7170	3266	11231	4365	4401	4470	2706	9168	18119
NJ SALEM			PARTICIPANTS											
1974	43371	41402	42621	30619	20450	18780	7515	24109	15514	6759	7036	13585	21202	19105
1985	56275	52076	53802	38602	28109	23647	9463	30231	19427	7999	8860	16786	29359	27985
1995	61502	55738	57469	41662	31461	25412	10170	32261	20813	8296	9521	17923	33346	33018
2005	67162	59974	61832	44831	35088	27479	10997	34556	22419	8760	10296	19265	37446	38198
2015	71443	63202	65104	47296	37792	29039	11621	36332	23653	9092	10880	20296	40438	42004
2025	74754	65714	67648	49218	39870	30251	12106	37714	24614	9339	11334	21103	42775	44919
			ACTIVITY DAYS											
1974	1505	360	997	1899	196	275	119	421	168	120	180	112	268	397
1985	2054	456	1258	2142	281	347	150	530	211	162	215	130	376	612
1995	2319	485	1321	2299	328	373	161	569	226	190	224	135	429	747
2005	2590	515	1416	2435	377	403	174	615	244	219	241	146	482	893
2015	2790	540	1488	2518	413	426	184	650	258	242	254	152	521	1003
2025	2945	560	1543	2578	440	443	192	677	268	259	264	158	551	1085
NJ SOMERSET			PARTICIPANTS											
1974	146793	134653	138073	103270	73151	61333	26650	78926	50906	22171	23070	45778	76816	73736
1985	174572	157184	161794	119762	89648	71625	31122	91878	59152	24330	26941	51940	95448	96349
1995	200215	178141	183024	136169	104680	81456	35394	103881	67102	26873	30639	58467	112072	116321
2005	217250	191955	197178	145878	115101	88244	38343	111399	72393	28328	33193	62589	123461	130048
2015	238297	209777	215316	159126	127002	96670	42005	121488	79207	30526	36362	68288	136257	144547
2025	245949	217208	222834	163948	130749	100267	43568	125603	82068	31252	37715	70404	140120	147626
			ACTIVITY DAYS											
1974	5406	1188	3207	6264	738	898	424	1411	553	440	589	367	1018	1629
1985	6652	1398	3752	6551	953	1049	495	1647	642	572	650	395	1270	2266
1995	7786	1577	4176	7485	1144	1193	563	1874	730	702	721	437	1492	2700
2005	8546	1678	4483	7885	1275	1292	610	2030	789	778	777	469	1643	3150
2015	9416	1824	4883	8458	1415	1415	668	2224	864	864	851	511	1811	3539
2025	9679	1884	5048	8612	1447	1468	693	2306	896	869	881	526	1863	3585
NJ SUSSEX			PARTICIPANTS											
1974	29531	27933	28555	20884	14411	12775	5704	16314	10546	4599	4807	9237	14704	13496
1985	88705	81568	83678	61022	44722	37349	16678	47490	30723	12636	14054	26470	46996	45504
1995	106843	102288	104714	74010	51891	47032	21001	59376	34566	15348	17698	31747	52350	46966
2005	135316	120675	123536	90754	71172	55732	24886	69760	45547	17773	20971	38916	76106	78548
2015	155102	137294	140371	103384	82461	63575	28388	79202	51910	20002	23922	44386	88284	92561
2025	172115	151644	154982	113809	92216	70412	31441	87259	57343	21636	26495	48710	98906	104601
			ACTIVITY DAYS											
1974	1042	246	670	1292	138	187	91	297	115	85	122	76	195	286
1985	3284	722	1962	3386	455	547	265	869	333	267	336	205	690	1012
1995	3694	901	2412	4264	482	688	334	1095	419	295	411	249	692	958
2005	5266	1051	2835	4935	773	816	396	1297	496	460	485	293	1022	1862
2015	6096	1186	3215	5531	907	931	452	1480	566	547	556	334	1184	2236
2025	6813	1307	3543	5934	1023	1031	500	1639	626	615	610	364	1326	2547
NJ UNION			PARTICIPANTS											
1974	385629	356845	367072	263911	192429	160173	67394	205015	131494	55067	59817	115579	201000	190751
1985	394627	357476	368884	263687	202437	160595	67571	204815	131189	52065	59974	113204	215215	213539
1995	409465	365389	376331	270295	214056	164863	69167	208640	134207	51251	61568	114644	229427	234224
2005	420171	371764	383062	273609	223067	168557	70922	211251	136628	50879	62948	115850	239932	249427
2015	429398	377943	389164	277873	229748	171751	72266	214319	134031	50938	64141	117560	247361	259825
2025	437573	383652	394812	281877	235411	174670	73494	217210	141218	51089	65231	119088	253802	268353
			ACTIVITY DAYS											
1974	14055	3076	8554	15169	1917	2350	1069	3698	1426	1096	1490	920	2594	6152
1985	14904	3102	8597	13657	2119	2356	1072	3708	1423	1198	1416	854	2796	4861
1995	15823	3152	8612	13932	2307	2419	1100	3806	1458	1323	1407	842	2988	5460
2005	16481	3167	8730	13818	2445	2473	1125	3892	1488	1395	1427	852	3125	5930
2015	16960	3205	8850	13750	2542	2520	1146	3965	1516	1457	1452	861	3220	6251
2025	17378	3243	8960	13777	2621	2563	1166	4033	1541	1504	1470	868	3304	6497
NJ WARREN			PARTICIPANTS											
1974	52412	50481	51538	36725	25538	22714	10365	28995	18678	7998	8498	16189	25870	23308
1985	64092	59593	61032	43458	32173	26864	12259	34102	21959	8866	10051	18782	33685	32065
1995	77166	70286	71824	51664	39675	31830	14525	40085	25928	10137	11909	22106	42170	41679
2005	93221	83636	85475	61596	48946	38015	17347	47524	30879	11861	14223	26337	52374	53446
2015	111441	99038	101109	72951	59320	45164	20610	56115	36613	13772	16898	31125	63620	66206
2025	130426	115189	117540	84763	70041	52654	24028	65124	42607	15755	19700	36079	75303	79243
			ACTIVITY DAYS											
1974	1830	437	1210	2231	239	333	165	542	203	144	216	136	343	482
1985	2347	518	1432	2357	322	394	195	641	238	181	239	146	450	696
1995	2921	607	1658	2794	414	467	231	759	282	233	275	167	566	936
2005	3611	715	1965	3274	526	557	276	907	336	300	329	199	702	1246
2015	4376	842	2317	3788	649	662	328	1077	399	376	389	233	852	1579
2025	5165	975	2690	4304	775	772	382	1256	465	450	450	268	1008	1911

IBE ASSOCIATES, INC.

TABLE 4.A.7 ---PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS, PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY TOTAL			PARTICIPANTS											
1974	9170403	8768660	9041891	6378580	4412104	3550445	1594766	4901936	2951162	1383652	1294686	2806889	4574355	4248458
1985	9757078	9066270	9378605	6613762	4831675	3687151	1654920	5060887	3048144	1355045	1349922	2854816	5125040	4967760
1995	10430162	9491822	9796592	6987718	5277363	3888433	1743886	5288124	3203966	1370332	1420709	2981450	5665920	5650096
2005	10973102	9849888	10156743	7256990	5653678	4068631	1830468	5467076	3338175	1397406	1487928	3095474	6109445	6235132
2015	11496509	10218881	10529192	7557249	5990701	4248327	1896718	5669695	3441000	1436082	1555195	3226765	6490075	6729542
2025	11879310	10489716	10796430	7757167	6245607	4384872	1962197	5811308	3585326	1449989	1606681	3305165	6791653	7104606
			ACTIVITY DAYS											
1974	322788	76072	213175	374089	43501	52468	25260	89341	31511	26471	35550	22852	50228	91990
1985	357333	79193	221077	348892	49951	54471	26217	92533	32566	29462	34956	21982	65710	111613
1995	393059	82524	226465	366711	56261	57429	27629	97345	34314	32912	35637	22262	72890	129799
2005	421793	84655	234088	375175	61558	60074	29009	101780	35848	35723	37077	23099	78874	146232
2015	447467	87431	242326	384013	66166	62709	30055	105675	37435	38466	38733	23957	83858	160298
2025	466621	89400	247767	387018	69647	64709	31099	108978	38609	40437	39632	24340	87836	170779
NY ALBANY SMSA			PARTICIPANTS											
1974	509104	485326	496234	355482	246922	209830	97710	275713	173393	77962	77809	157471	253659	231991
1985	558830	517907	531557	374094	279347	224211	104407	293190	184144	78168	83142	164498	294773	282865
1995	598465	544123	556930	402046	305998	236572	110163	307104	193762	79804	87726	172873	327172	324708
2005	636798	570562	584172	421358	331858	249131	116011	320625	203254	81886	92383	180739	357210	364379
2015	673284	597466	610954	442292	355438	261610	121822	334964	213142	84662	97010	189674	383717	398791
2025	705167	621808	635389	459605	375818	273110	127177	347655	221977	86623	101275	196650	406724	427437
			ACTIVITY DAYS											
1974	17930	4200	11740	21450	2372	3085	1554	5161	1869	1429	2055	1303	3341	4915
1985	20528	4509	12571	20434	2838	3297	1660	5515	1985	1620	2071	1283	3910	6247
1995	22672	4709	12935	21733	3222	3479	1752	5819	2093	1847	2130	1315	4353	7368
2005	24633	4883	13507	22329	3589	3663	1845	6128	2200	2059	2225	1371	4754	8520
2015	26394	5086	14092	23045	3912	3847	1937	6435	2310	2272	2338	1432	5103	9523
2025	27906	5266	14638	23472	4181	4016	2023	6718	2408	2428	2422	1475	5409	10319
NY BROOME & TIOGA			PARTICIPANTS											
1974	180329	173362	177002	127424	87108	76431	35408	99523	63263	28269	28500	56568	88578	80561
1985	192447	179479	183951	132014	95998	79235	36708	102672	65187	27508	29545	57397	100593	96259
1995	203543	185902	190137	138186	103779	82319	38136	106118	67581	27700	30695	59469	110263	109339
2005	212881	191672	196034	142534	110676	85248	39493	108947	69744	28043	31787	61323	118405	120653
2015	220651	196873	201171	146810	116018	87740	40648	111707	71724	28497	32717	63182	124503	129022
2025	227230	201464	205775	150167	120485	89977	41684	114085	73435	28724	33551	64503	129644	135803
			ACTIVITY DAYS											
1974	6285	1510	4166	7914	827	1122	563	1851	684	513	749	471	1178	1699
1985	7032	1573	4325	7346	968	1163	584	1919	705	566	729	450	1345	2121
1995	7671	1623	4390	7674	1087	1208	607	1993	732	638	737	454	1470	2481
2005	8197	1654	4510	7766	1191	1251	628	2064	757	698	762	468	1587	2823
2015	8598	1692	4617	7870	1268	1288	647	2125	779	751	786	480	1667	3077
2025	8933	1725	4714	7892	1331	1321	663	2179	798	788	801	487	1736	3274
NY CHENANGO			PARTICIPANTS											
1974	31398	30735	31511	22332	15148	14579	6368	18091	11970	5026	5510	9900	14893	13184
1985	35116	33319	34062	24140	17507	15741	6875	19404	12837	5059	5949	10458	17873	16655
1995	38449	35512	36222	26127	19630	16832	7351	20638	13701	5264	6361	11224	20435	19792
2005	41554	37692	38449	27812	21676	17943	7837	21815	14557	5484	6781	11947	22812	22804
2015	43772	39216	39956	29059	23160	18721	8176	22645	15169	5632	7075	12492	24539	25052
2025	45781	40673	41413	33145	24485	19469	8503	23433	15745	5745	7358	12935	26052	26980
			ACTIVITY DAYS											
1974	1063	268	737	1443	138	213	101	332	130	89	136	84	198	271
1985	1254	290	796	1388	169	230	109	358	140	100	138	83	239	356
1995	1425	308	834	1493	198	246	117	383	150	116	144	86	274	436
2005	1581	323	882	1555	226	262	125	409	159	131	153	92	305	521
2015	1694	334	915	1591	247	274	130	426	166	143	160	95	329	585
2025	1793	345	947	1612	265	285	135	443	173	154	166	98	349	640
NY COLUMBIA			PARTICIPANTS											
1974	36772	36432	37120	25605	17747	16425	7408	20747	13419	5615	6134	11227	17543	19568
1985	42453	40329	41210	28567	21201	18235	8225	22863	14796	5811	6810	12256	21834	20394
1995	47464	43802	44655	31542	24306	19875	8964	24771	16089	6144	7422	13407	25544	24827
2005	51522	46602	47521	33730	26999	21225	9574	26253	17129	6420	7926	14331	28708	28893
2015	55421	49485	50395	36026	29453	22595	10192	27823	18217	6749	8438	15317	31516	32387
2025	58987	52217	53128	38048	31685	23910	10785	29288	19239	7012	8929	16147	34041	35464
			ACTIVITY DAYS											
1974	1245	311	871	1582	163	241	118	391	146	102	152	94	231	320
1985	1522	346	967	1561	207	268	131	435	161	118	158	96	289	434
1995	1769	374	1032	1708	248	292	143	474	175	139	168	101	339	546
2005	1977	393	1094	1786	285	311	152	506	187	160	179	108	382	661
2015	2163	416	1158	1875	318	332	162	538	199	180	192	114	419	758
2025	2330	437	1220	1937	347	351	172	570	210	197	202	120	453	842
NY DELAWARE			PARTICIPANTS											
1974	30276	30422	30934	21416	14455	13708	6303	17382	11247	4826	5124	9499	14133	12394
1985	33254	32222	32874	22703	16357	14566	6698	18318	11860	4756	5445	9826	16575	15161
1995	38613	36362	37011	26062	19411	16491	7582	20627	13400	5240	6184	11187	20090	19014
2005	46618	43062	43835	31029	23885	19602	9013	24336	15882	6108	7327	13332	25053	24373
2015	58360	53102	53985	38532	30381	24236	11144	29948	19616	7457	9059	16573	32146	32060
2025	73001	65658	66692	47796	38499	30047	13816	36945	24275	9081	11231	20524	41029	41667
			ACTIVITY DAYS											
1974	1010	260	725	1375	131	201	100	329	122	85	130	82	189	294
1985	1163	277	771	1293	156	214	107	349	129	92	129	79	222	318
1995	1401	311	855	1473	192	242	121	396	146	110	143	87	269	408
2005	1736	364	1008	1720	243	288	143	470	173	136	170	103	335	539
2015	2219	447	1241	2093	318	356	177	581	214	179	211	128	430	729
2025	2822	550	1531	2537	410	441	220	721	265	230	261	156	550	964

IDE ASSOCIATES, INC.

TABLE 4.A.7——PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP——MEDIUM GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY DUTCHESS			PARTICIPANTS											
1974	159381	151822	155835	112316	77054	68013	29486	88047	56270	24719	25492	49675	78550	71282
1985	189088	175963	181193	130435	94704	78398	34205	101766	64955	27130	29526	56650	99193	94751
1995	224290	203330	208889	152269	114799	91491	39664	117304	75144	30372	36238	65409	122008	121670
2005	261001	233732	240128	174684	136010	105706	45827	134208	86458	34199	39558	74957	145468	148487
2015	342629	303410	315164	229924	179428	136815	53795	176108	112503	46899	51199	100228	192560	200144
2025	344294	303732	311531	227026	183273	138102	59872	173605	112578	63083	51681	97144	196989	207000
			ACTIVITY DAYS											
1974	5559	1332	3676	6783	730	997	468	1583	609	449	652	407	1022	1499
1985	6936	1554	4278	7090	952	1157	543	1837	703	555	720	439	1302	2085
1995	8483	1789	4839	8231	1208	1342	630	2130	814	714	811	491	1607	2784
2005	10064	2030	5541	9288	1464	1550	728	2461	939	859	931	563	1918	3482
2015	13302	2665	7553	11508	1971	2006	851	3050	1218	1185	1270	765	2464	4878
2025	13561	2614	7158	11589	2028	2025	951	3215	1225	1203	1208	721	2596	5010
NY GREENE			PARTICIPANTS											
1974	24316	24308	24748	16800	11754	11036	4992	13792	8975	3649	4124	7334	11538	10170
1985	28749	27538	28110	19225	14355	12533	5670	15563	10130	3880	4683	8219	14487	13609
1995	32541	30245	30748	21478	16660	13817	6251	17046	11140	4141	5163	9098	17415	16783
2005	36236	32990	33604	23577	18972	15122	6841	18529	12158	4444	5650	9984	20079	20033
2015	39873	35787	36406	25743	21192	16447	7440	20058	13208	4767	6145	10907	22608	23069
2025	43996	39108	39747	28206	23643	18018	8150	21876	14447	5143	6732	11932	25340	26250
			ACTIVITY DAYS											
1974	818	206	580	1021	107	162	79	263	97	66	100	61	153	207
1985	1023	235	659	1035	139	184	90	299	110	78	107	64	195	286
1995	1205	256	712	1143	168	203	99	329	121	93	115	69	232	365
2005	1381	277	774	1229	198	222	109	360	133	109	126	75	267	453
2015	1550	299	837	1314	227	241	118	392	144	126	137	81	301	534
2025	1732	325	914	1411	257	264	130	429	158	143	150	88	338	618
NY NASSAU & SUFFOLK			PARTICIPANTS											
1974	1875942	1722687	1763337	1322990	936222	784603	339235	1008008	651269	286720	294924	589868	981678	944941
1985	2027278	1828694	1879718	1391176	1041057	833785	360500	1066316	687853	284298	313411	605314	1106417	1114430
1995	2209698	1968906	2019988	1506233	1153545	899818	389050	1146403	741266	299517	338232	649556	1233283	1275829
2005	2366311	2093077	2147024	1594996	1250865	961149	415568	1213695	789002	313336	361285	688371	1340616	1406897
2015	2516960	2216969	2271410	1689683	1338271	1020327	441154	1283127	837012	329105	383530	730670	1435123	1517232
2025	2662729	2338824	2395620	1777075	1422265	1078615	466356	1351027	883416	341580	405440	767229	1526803	1621359
			ACTIVITY DAYS											
1974	69131	15099	40988	82013	9460	11489	5393	18037	7069	5688	7645	4790	12978	20985
1985	77136	16144	43575	77661	11036	12210	5731	19168	7469	6619	7623	4656	14674	25919
1995	85746	17342	46119	84335	12562	13177	6184	20686	8058	7713	8057	4902	16370	30397
2005	92886	18210	48873	88365	13802	14075	6606	22096	8595	8423	8597	5226	17789	34046
2015	99293	19198	51640	92436	14860	14961	7013	23457	9126	9087	9172	5546	19027	37042
2025	105448	20188	54381	95194	15860	15795	7413	24797	9639	9645	9638	5787	20240	39748
NY NEW YORK CITY			PARTICIPANTS											
1974	5107345	4976637	5159830	3528424	2403671	1851718	846971	2706926	1545083	765169	659087	1542234	2488256	2273928
1985	5259840	4960941	5159720	3544013	2543956	1846145	844422	2692584	1533234	727181	657104	1522990	2705421	2571596
1995	5450206	5016256	5206416	3619462	2696658	1874972	857607	2711924	1550821	704452	667364	1534674	2911220	2852032
2005	5547233	5019415	5205163	3633605	2799469	1885933	862621	2700278	1552903	692396	671266	1539568	3050154	3061651
2015	5594849	5000402	5174768	3634046	2862558	1884390	861915	2682609	1548475	678630	670716	1538427	3138802	3207424
2025	5600133	4961455	5135660	3611660	2894721	1874210	857259	2655664	1537074	663602	667093	1526070	3186576	3297626
			ACTIVITY DAYS											
1974	175788	43004	122400	199926	23570	27557	13375	49502	16282	14431	19108	12538	30753	48767
1985	188662	43151	122560	180373	26094	27474	13335	49353	16154	15150	18172	11710	33694	56852
1995	201817	43376	121056	181971	28540	27903	13543	50124	16380	16293	17742	11365	36412	64131
2005	210277	42913	120762	179337	30365	28066	13622	50417	16437	17137	17749	11342	38260	70512
2015	215633	42515	119805	175524	31631	28043	13611	50376	16410	17810	17668	11219	39466	75162
2025	218343	42029	118638	170781	32397	27892	13537	50104	16301	18254	17463	11025	40115	78233
NY ORANGE			PARTICIPANTS											
1974	159985	153796	157490	113030	77073	67749	30063	88413	56071	25172	25240	50159	78268	70892
1985	194931	181311	186320	133685	97083	79970	35487	103883	65810	27930	29794	58147	101719	97180
1995	240698	218932	224540	163110	122717	96902	43000	125111	79531	32696	36102	70160	130490	129328
2005	278490	249448	255784	185809	145055	110995	49254	141851	90710	36476	41352	79830	155391	158538
2015	313854	278385	285101	207906	165506	124222	55124	157943	101382	40197	46280	89333	177981	184751
2025	336989	297014	304047	221734	179215	132818	58938	166176	108230	42277	49482	95159	193256	202776
			ACTIVITY DAYS											
1974	5554	1340	3721	6998	730	995	478	1612	605	455	661	417	1020	1493
1985	7110	1589	4401	7390	978	1174	564	1903	711	574	738	455	1336	2142
1995	9071	1910	5203	8987	1286	1423	683	2305	860	755	869	533	1719	2936
2005	10742	2149	5909	10022	1564	1630	783	2641	983	916	990	605	2048	3716
2015	12270	2385	6571	11025	1814	1824	876	2955	1100	1070	1108	674	2346	4411
2025	13293	2536	7003	11499	1986	1950	936	3160	1175	1170	1180	713	2548	4896
NY OTSEGO			PARTICIPANTS											
1974	38445	38169	38874	27361	18310	17080	7870	21904	14097	6333	6383	12328	18072	15918
1985	43220	41156	42066	29659	21305	18473	8512	23505	15130	6394	6903	13055	21880	20258
1995	48187	44519	45372	32560	24408	20089	9256	25328	16392	6684	7507	14168	25596	24661
2005	52313	47370	48282	34843	27100	21453	9864	26850	17455	6987	8017	15155	28776	28605
2015	55497	49564	50453	36668	29204	22512	10373	28029	18291	7222	8413	15953	31266	31887
2025	58350	51654	52550	38285	31050	23511	10833	29156	19073	7429	8786	16624	33304	34586
			ACTIVITY DAYS											
1974	1289	329	933	1727	168	251	129	410	153	109	170	107	240	334
1985	1531	356	1010	1658	207	271	135	444	164	122	173	106	292	438
1995	1779	382	1069	1805	247	295	147	483	178	142	182	112	342	546
2005	1988	403	1132	1892	284	315	157	515	190	162	194	119	385	658
2015	2152	419	1180	1958	314	330	165	541	199	179	204	124	419	748
2025	2292	435	1227	2007	339	345	172	565	208	194	212	128	447	825

EDE ASSOCIATES, INC.

TABLE 4.A.7---PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--MEDIUM GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY PUTNAM			PARTICIPANTS											
1974	45118	42240	43145	32176	22180	19271	8594	24780	15999	7088	7254	14262	22946	21510
1985	60950	55763	57172	42208	30971	25483	11364	32588	21028	8736	9592	18295	32676	32343
1995	78300	70567	72232	53642	40604	32353	14427	41139	26628	10723	12178	22990	43206	44178
2005	97003	86552	88558	65701	51088	39867	17778	50254	32710	12990	15006	28203	54955	56908
2015	117618	104334	106633	79221	62438	48179	21485	60459	39491	15494	18135	34044	66735	70350
2025	141806	125288	127982	94852	75724	58006	25867	72431	47456	18279	21834	40702	81065	85951
			ACTIVITY DAYS											
1974	1626	374	1007	2040	217	282	137	448	173	134	185	116	307	462
1985	2287	497	1331	2395	322	373	181	592	228	195	230	141	439	736
1995	3011	626	1653	3029	436	474	230	752	289	269	284	172	581	1036
2005	3787	759	2024	3670	559	584	283	926	356	345	350	213	733	1366
2015	4623	910	2433	4359	690	705	342	1120	430	427	425	257	896	1710
2025	5604	1089	2917	5098	842	849	412	1348	517	518	509	305	1088	2101
NY ROCKLAND & WESTCHESTER			PARTICIPANTS											
1974	811012	744177	764097	559573	407193	329167	142655	427679	271753	117631	122685	245908	420302	417211
1985	889879	800984	825241	599600	458722	354449	153612	459145	291229	119366	132108	258083	490335	496752
1995	979842	871024	895995	653109	513564	386872	167664	497789	316655	125099	144192	277681	552261	572795
2005	1060421	937901	962491	697724	562896	417833	188222	532114	340727	131427	155732	296368	606609	637677
2015	1142615	1003567	1031218	748999	609897	448970	194576	569796	365923	139722	167337	318775	658324	696883
2025	1219416	1068125	1097452	795629	653286	478476	207363	605589	389558	146551	178334	338141	705951	750243
			ACTIVITY DAYS											
1974	30041	6468	17808	32754	4171	4833	2265	7740	2940	2464	3130	1954	5603	9368
1985	34005	7014	19216	31662	4913	5204	2439	8334	3151	2901	3194	1946	6422	11610
1995	38149	7593	20491	34240	5632	5680	2662	9096	3434	3364	3373	2041	7241	13633
2005	41773	8074	21931	36010	6246	6134	2992	9999	3701	3704	3621	2192	8046	15393
2015	45271	8597	23445	38191	6814	6592	3089	10557	3979	4035	3909	2349	8627	16949
2025	48480	9129	24894	39745	7328	7025	3292	11250	4238	4320	4146	2476	9251	18312
NY SCHOHARIE			PARTICIPANTS											
1974	19394	19530	19814	13925	9259	8906	4041	11250	7334	3220	3339	6269	9001	7918
1985	23367	22588	22994	16167	11528	10334	4690	12946	8445	3477	3875	7103	11677	10770
1995	27685	25966	26381	18873	13949	11926	5412	14840	9718	3880	4472	8208	14500	13888
2005	31285	28731	29194	21008	16171	13245	6010	16359	10762	4222	4966	9135	16978	16810
2015	32979	30840	31297	22219	16790	14254	6468	17525	11570	4486	5345	9699	17416	16727
2025	36736	32880	33341	24244	19521	15244	6917	18634	12345	4703	5716	10525	20794	21408
			ACTIVITY DAYS											
1974	647	167	468	921	84	131	64	211	80	56	87	55	121	164
1985	822	194	543	950	110	151	75	245	92	66	95	58	157	229
1995	1013	222	613	1095	140	175	86	282	106	82	107	65	195	304
2005	1178	243	676	1194	167	194	96	313	117	96	118	72	228	381
2015	1212	260	723	1267	168	209	103	337	126	94	128	77	234	366
2025	1432	276	769	1321	210	223	110	361	135	121	135	81	279	505
NY SULLIVAN			PARTICIPANTS											
1974	37932	38061	38925	26516	18141	16934	7504	21639	13862	5856	6305	11655	17847	15723
1985	46503	45112	46276	31537	22843	20107	8910	25556	16362	6520	7487	13559	23191	21273
1995	54944	51863	53091	36671	27628	23227	10293	29266	18830	7210	8649	15568	28601	27143
2005	67961	63008	64520	44643	34809	28344	12560	35397	22882	8539	10554	18909	36481	35489
2015	75181	68769	70354	43011	39014	31007	13741	38556	25011	9224	11546	20814	41218	40902
2025	87086	78772	80529	56245	45763	35623	15786	44045	28668	10366	13264	23827	48693	49137
			ACTIVITY DAYS											
1974	1271	326	914	1622	166	249	119	403	150	104	158	98	234	322
1985	1625	388	1087	1721	219	295	142	479	177	127	177	107	304	448
1995	1990	443	1225	1966	274	341	164	553	204	155	198	119	375	585
2005	2523	532	1480	2342	355	416	200	675	249	196	238	143	479	783
2015	2840	578	1612	2515	406	455	218	738	272	223	263	157	542	923
2025	3342	659	1843	2809	485	523	251	848	312	265	299	177	641	1127
NY ULSTER			PARTICIPANTS											
1974	103454	100758	102995	73210	49867	44995	20158	58040	37157	16397	16814	32532	50083	45267
1985	130365	122964	126141	89519	64743	54986	24635	70590	45144	18829	20548	38966	67044	63464
1995	156837	144513	147735	106348	79657	64877	29066	82716	53108	21406	24244	45767	83836	82099
2005	185475	168074	171984	123937	96149	75835	33975	95765	61842	24449	28338	53322	102150	102855
2015	212966	190712	194927	141110	111953	86302	38665	108400	70266	27339	32250	60677	119621	122861
2025	237589	211044	215574	156250	126154	95736	42891	119699	77810	29791	35775	67053	135318	140797
			ACTIVITY DAYS											
1974	3561	877	2440	4520	469	660	321	1067	402	297	435	273	661	957
1985	4696	1077	2988	4935	643	807	392	1304	488	381	503	307	889	1391
1995	5837	1259	3438	5827	820	952	462	1539	576	481	576	350	1113	1843
2005	7071	1446	3984	6671	1018	1112	540	1799	672	592	671	407	1357	2378
2015	8252	1631	4504	7442	1210	1266	615	2047	764	706	762	460	1580	2901
2025	9310	1798	4974	8065	1382	1404	682	2271	847	806	841	506	1798	3360
CT TOTAL			PARTICIPANTS											
1974	1191230	1111564	1140420	828572	588876	496699	216700	641148	409954	178520	185616	366133	611639	576019
1985	1324451	1207913	1243367	897835	674031	540333	235817	694478	443547	182868	201914	388869	714304	704469
1995	1456504	1307881	1343487	975853	756294	587591	256514	749426	480661	191133	219572	417649	808926	821862
2005	1580976	1405238	1443784	1044863	834233	634274	276957	801495	516782	200964	237014	446556	895958	929066
2015	1709496	1506420	1545846	1121033	907737	681656	297741	857470	554814	213012	254721	479385	976173	1024201
2025	1811535	1593205	1633965	1182342	970816	722922	315814	904635	587100	221271	270140	504261	1045697	1105162
			ACTIVITY DAYS											
1974	43000	9666	26790	49339	5814	7286	3442	11637	4439	3446	4756	2971	7990	12520
1985	49669	10570	29211	48117	7011	7927	3746	12662	4803	4059	4898	2989	9400	16014
1995	55998	11379	30995	52137	8114	8620	4075	13772	5214	4758	5196	3127	10670	19140
2005	61763	12078	33175	54840	9124	9305	4400	14868	5619	5328	5532	3349	11819	22123
2015	67174	12680	35427	58067	10033	10000	4730	15981	6039	5901	5958	3588	12868	24720
2025	71806	13565	37393	59979	10805	10605	5017	16950	6395	6337	6263	3746	13784	26047

IDE ASSOCIATES, INC.

TABLE 4.A.7---PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--MEDIUM GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS, PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
CT FAIRFIELD			PARTICIPANTS											
1974	560187	517125	530646	388528	279933	232633	100440	299144	191979	82700	87070	171535	292790	281047
1985	600741	543160	559275	406396	308650	244553	105586	313292	200776	81770	91531	179521	328323	329255
1995	644003	574401	590353	431107	336912	259632	112096	330335	212491	83661	97175	184063	361085	371700
2005	682918	604042	620945	451197	362310	274355	118453	345768	223640	86096	102686	192458	389358	407577
2015	719767	633573	650631	473313	384382	288418	124525	362007	234890	89359	107949	202089	413472	436502
2025	753353	660915	678201	492401	404527	301705	130262	376742	245223	91766	112923	209925	435473	462247
			ACTIVITY DAYS											
1974	20539	4499	12390	23065	2819	3411	1595	5403	2081	1672	2210	1377	3833	6227
1985	22803	4759	13047	21733	3263	3586	1677	5680	2177	1913	2199	1336	4320	7614
1995	24979	5008	13535	23005	3659	3807	1761	6030	2308	2174	2264	1368	4757	8781
2005	26838	5201	14183	23670	3996	4023	1881	6372	2435	2362	2380	1435	5130	9802
2015	28457	5429	14829	24502	4271	4229	1978	6699	2559	2532	2508	1505	5444	10999
2025	29930	5638	15440	25042	4516	4424	2069	7008	2674	2664	2607	1594	5736	11272
CT LITCHFIELD			PARTICIPANTS											
1974	102619	96583	98632	71103	50697	44172	19073	55754	36250	15221	16585	31272	52133	48190
1985	119527	109537	112202	80577	61042	50192	22581	63005	40952	16230	18845	34738	64406	62882
1995	138186	124520	127292	92030	72156	57306	25782	71389	46597	17833	21517	39219	76963	77789
2005	159255	138215	141323	101957	82626	63890	28744	78898	51762	19390	23989	43369	88511	91893
2015	178579	158018	161643	116382	95945	73251	32955	89978	59240	21780	27504	49415	102854	108147
2025	196000	170924	174503	125594	104916	79446	35742	97100	64132	23151	29829	53238	112645	119290
			ACTIVITY DAYS											
1974	3666	836	2311	4250	488	647	316	1037	394	285	410	254	693	1019
1985	4473	953	2628	4322	626	735	359	1179	445	353	441	266	863	1402
1995	5318	1077	2933	4915	768	839	410	1346	507	440	488	293	1034	1790
2005	6091	1181	3242	5355	901	936	457	1500	565	522	541	325	1180	2181
2015	7063	1343	3693	5987	1058	1073	525	1720	647	618	618	368	1378	2605
2025	7719	1447	3987	6319	1165	1164	569	1866	701	678	666	394	1509	2896
CT NEW HAVEN			PARTICIPANTS											
1974	528424	497856	511142	368941	258246	219894	96387	286250	181725	80599	81961	163526	266707	266770
1985	604183	555216	571870	410862	304339	245588	107650	318181	201819	84868	91538	178410	321575	312392
1995	674315	608960	625842	452716	347226	270653	118636	347702	221573	89639	100880	194367	370958	372369
2005	742803	662981	681516	491709	389297	296029	129760	376829	241380	95478	110339	210729	418089	429596
2015	807150	714829	733822	531338	427410	319987	140261	405493	260684	101873	119268	227881	459867	479632
2025	864182	761366	781261	564367	461373	341771	149810	430793	277745	106354	127388	241098	497379	523625
			ACTIVITY DAYS											
1974	18795	4331	12090	22024	2507	3228	1531	5196	1964	1489	2134	1340	3472	5282
1985	22393	4858	13536	22061	3122	3606	1710	5804	2181	1793	2259	1386	4217	6999
1995	25700	5294	14528	24217	3687	3974	1884	6396	2399	2136	2405	1466	4879	8569
2005	28834	5696	15751	25815	4227	4346	2061	6996	2620	2444	2612	1589	5501	10140
2015	31655	6107	16904	27577	4704	4698	2228	7562	2832	2751	2833	1715	6046	11516
2025	34157	6480	17966	28617	5124	5018	2379	8076	3020	2994	2990	1798	6539	12681
DE TOTAL			PARTICIPANTS											
1974	281038	264664	272548	201324	135701	117280	48548	154707	97964	45517	43832	90443	139219	128396
1985	328583	301775	312088	228847	163439	133817	55393	175840	111128	48734	50013	100676	172065	166338
1995	379335	342319	353197	261299	192742	152446	63105	198868	126208	53617	56975	113757	205435	205147
2005	426222	379860	391819	289644	220712	170030	70383	219686	140214	58462	63547	126020	236579	242304
2015	469284	414896	427479	316842	245791	186184	77070	239460	153375	63131	69585	137892	263900	274844
2025	503626	443030	456639	336635	266151	199323	82509	255017	163692	65744	74495	145577	286354	301290
			ACTIVITY DAYS											
1974	9899	2335	6444	12637	1310	1720	770	2683	1058	828	1190	753	1777	2777
1985	12072	2683	7370	12851	1668	1963	878	3061	1200	998	1281	791	2220	3740
1995	14338	3026	8182	14694	2037	2236	1000	3487	1365	1222	1417	872	2663	4728
2005	16431	3317	9047	16061	2391	2494	1116	3890	1520	1432	1574	967	3070	5739
2015	18287	3604	9844	17299	2702	2731	1222	4259	1665	1638	1728	1055	3421	6637
2025	19784	3838	10501	17801	2954	2924	1308	4560	1778	1787	1816	1099	3713	7344
DE NEW CASTLE			PARTICIPANTS											
1974	261036	264664	272548	201324	135701	117280	68548	154707	97964	45517	43832	90443	139219	128396
1985	328583	301775	312088	228847	163439	133817	55393	175840	111128	48734	50013	100676	172065	166332
1995	379335	342319	353197	261299	192742	152446	63105	198868	126208	53617	56975	113757	205435	205147
2005	426222	379860	391819	289644	220712	170030	70383	219686	140214	58462	63547	126020	236579	242304
2015	469284	414896	427479	316842	245791	186184	77070	239460	153375	63131	69585	137892	263900	274844
2025	503626	443030	456639	336635	266151	199323	82509	255017	163692	65744	74495	145577	286354	301290
			ACTIVITY DAYS											
1974	9899	2335	6444	12637	1310	1720	770	2683	1058	828	1190	753	1777	2777
1985	12072	2683	7370	12851	1668	1963	878	3061	1200	998	1281	791	2220	3740
1995	14338	3026	8182	14694	2037	2236	1000	3487	1365	1222	1417	872	2663	4728
2005	16431	3317	9047	16061	2391	2494	1116	3890	1520	1432	1574	967	3070	5739
2015	18287	3604	9844	17299	2702	2731	1222	4259	1665	1638	1728	1055	3421	6637
2025	19784	3838	10501	17801	2954	2924	1308	4560	1776	1787	1816	1099	3713	7344

IDE ASSOCIATES, INC.

TABLE 4.A.7a—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
TOTAL SERVICE AREA			PARTICIPANTS											
1974	20268333	19311158	19876067	14141492	9800730	8150838	3592909	10942144	6757215	3077000	3004086	6238927	10107568	9369420
1985	21498762	19927447	20579126	14604324	10700577	8428546	3712719	11262586	6949116	2998739	3107351	6318846	11303265	10924235
1995	22738969	20661361	21291508	15264933	11562175	8785059	3869354	11646031	7219629	3006473	3239856	6531011	12364309	12324659
2005	23803811	21338037	21982004	15777552	12320631	9125120	4018469	11979683	7470800	3049840	3366257	6745763	13262840	13524071
2015	24846231	22065034	22704725	16358753	13009531	9471133	4169947	12365581	7743571	3115197	3494920	6995172	14055736	14559868
2025	25820971	22781025	23425606	16890129	13637483	9813892	4320376	12745922	8009538	3169610	3622623	7209994	14772726	15463725
			ACTIVITY DAYS											
1974	713642	167686	467785	840931	95587	120071	56966	198437	72563	58074	80263	50996	129576	200971
1985	788244	174179	484283	780179	109749	124151	58867	204990	74664	63979	78558	48795	145921	244170
1995	857893	179671	491912	811459	122481	129389	61354	213486	77728	71400	79333	48991	160159	281849
2005	915909	183453	506089	824988	133463	134386	63721	221575	80620	77295	82053	50564	172049	316727
2015	968159	188752	521444	841076	143090	139470	66126	229797	83661	83250	85153	52157	182454	346756
2025	1015259	194185	537186	851437	151536	144502	68515	237909	86615	88179	87691	53361	191908	372085
PA TOTAL			PARTICIPANTS											
1974	4887542	4714345	4842909	3423098	2346147	2036651	892327	2685743	1683901	752021	754605	1512698	2381467	2150559
1985	5152408	4828372	4976646	3509367	2545155	2088920	914737	2741412	1716924	725201	773955	1520012	2657909	2508786
1995	5471122	5011959	5154203	3679725	2766197	2180445	955197	2837765	1786224	729002	808147	1577468	2935052	2868246
2005	5709409	5153056	5298844	3790409	2940223	2253091	987191	2906692	1839499	736682	835255	1624770	3145663	3152365
2015	5953223	5310086	5453956	3923097	3110896	2329341	1020663	2989762	1899365	750471	863686	1681517	3345096	3425856
2025	6200227	5483302	5626994	4057580	3276636	2414993	1050767	3082675	1965849	764517	895824	1736165	3535432	3675619
			ACTIVITY DAYS											
1974	168723	40815	113912	206953	22208	29955	14157	48827	18150	13668	19055	12528	30560	45186
1985	185729	42056	117073	189947	25379	30724	14512	50070	18509	14655	19237	11857	34388	54575
1995	203857	43413	119177	197909	28630	32066	15155	52230	19293	16388	19486	11943	38155	64046
2005	217402	44139	121998	203644	31210	33133	15664	53945	19914	17702	20069	12285	40972	72305
2015	230486	45260	125297	204041	33729	34252	16195	55747	20584	19334	20757	12634	43607	80501
2025	242986	46567	129087	207047	36046	35507	16801	57751	21325	20775	21402	12945	46142	87725
PA BERKS			PARTICIPANTS											
1974	209054	200449	204963	143862	101331	88456	40939	113810	72533	30507	32922	62781	103156	92572
1985	221056	205182	210374	147971	110861	90720	41986	116091	73963	29423	33765	63391	116646	110734
1995	232863	211631	216567	153974	119618	93936	43475	119375	76354	29371	34962	65296	127740	126030
2005	244182	218547	223652	159165	128218	97413	45084	122766	78908	29723	36256	67385	137846	140516
2015	253793	224999	230011	164242	135049	100552	46537	126117	81330	30222	37424	69437	145562	151346
2025	262425	231196	236173	168660	140903	103578	47938	129297	83643	30542	38551	71232	152227	160111
			ACTIVITY DAYS											
1974	7263	1726	4791	8381	950	1299	651	2151	785	556	820	510	1399	1897
1985	8098	1776	4919	7710	1111	1332	668	2206	801	608	796	484	1552	2387
1995	8818	1822	4981	7966	1250	1380	692	2284	828	689	801	484	1705	2815
2005	9470	1861	5126	8055	1382	1431	717	2369	857	772	827	498	1840	3262
2015	9977	1906	5261	8185	1483	1477	740	2445	885	843	852	511	1941	3595
2025	10411	1951	5396	8202	1564	1521	763	2518	911	891	875	520	2030	3849
PA BRADFORD			PARTICIPANTS											
1974	38360	38534	39274	27672	18106	17373	7926	22312	14365	6301	6511	12311	17641	15350
1985	40536	39122	40012	28236	19770	17683	8067	22553	14523	6071	6628	12298	20073	18359
1995	42738	40053	40877	29291	21397	18191	8299	23007	14884	6011	6818	12613	22215	21132
2005	44629	40992	41826	30166	22830	18686	8525	23464	15252	6057	7003	13010	24013	23611
2015	46178	41807	42603	30909	24024	19126	8725	23863	15578	6101	7168	13334	25485	25672
2025	47561	42632	43430	31634	25018	19529	8909	24303	15894	6165	7319	13641	26680	27332
			ACTIVITY DAYS											
1974	1270	336	923	1823	163	255	126	412	156	111	168	106	236	314
1985	1417	343	940	1656	189	259	128	420	157	115	161	99	269	387
1995	1555	349	944	1697	213	267	132	432	162	126	160	98	298	458
2005	1670	353	963	1706	235	274	136	444	166	137	165	101	322	531
2015	1765	358	981	1713	254	280	139	454	170	148	169	103	342	592
2025	1842	364	999	1719	269	286	142	464	173	157	172	104	358	643
PA BUCKS			PARTICIPANTS											
1974	315618	294269	301318	227320	153537	133834	58700	173732	111898	51188	50405	102510	158746	147396
1985	341949	311299	320184	238811	172253	141813	62200	183040	117759	50524	53410	105160	182087	178937
1995	372229	333701	342654	257701	191433	152390	66839	195889	126322	52898	57393	112395	204247	207818
2005	400560	355321	364642	273219	209920	163291	71621	207460	134722	55062	61499	119016	224772	234129
2015	429082	378381	387812	290298	227187	174561	76564	220253	143687	57633	65744	126311	243434	256757
2025	455276	400052	409873	306586	242351	184857	81079	232534	151990	60220	69621	133221	260026	276099
			ACTIVITY DAYS											
1974	11278	2613	7078	14440	1493	1959	934	3082	1213	925	1350	852	2104	3182
1985	12765	2781	7497	13601	1783	2075	990	3265	1277	1072	1341	826	2430	4081
1995	14259	2974	7896	14668	2095	2230	1063	3509	1372	1263	1408	864	2731	4894
2005	15617	3121	8364	15322	2302	2390	1139	3760	1467	1413	1499	917	3004	5653
2015	16872	3302	8875	15988	2517	2555	1218	4020	1566	1552	1596	970	3250	6283
2025	17994	3482	9362	16644	2702	2705	1290	4257	1658	1665	1683	1018	3471	6797
PA CARBON			PARTICIPANTS											
1974	33363	33762	34425	22973	15769	14989	7069	19016	12207	4937	5578	9937	15316	12991
1985	35627	34490	35260	23739	17382	15354	7242	19345	12424	4729	5714	10061	17665	15737
1995	38087	35696	36425	25031	19065	15948	7522	19965	12870	4751	5935	10521	19866	18432
2005	40214	36822	37550	26054	20642	16522	7793	20514	13291	4823	6148	10958	21847	21086
2015	42277	38020	38756	27163	22135	17085	8058	21151	13734	4926	6358	11432	23697	23693
2025	44256	39332	40056	28189	23529	17725	8360	21825	14221	5014	6596	11843	25339	25865
			ACTIVITY DAYS											
1974	1088	287	799	1372	139	220	113	368	132	88	135	83	203	295
1985	1231	294	818	1253	163	226	115	377	135	90	130	78	235	317
1995	1375	303	833	1302	186	234	120	391	140	99	132	79	265	382
2005	1502	309	857	1327	210	243	124	405	135	111	136	82	292	457
2015	1622	318	883	1349	233	251	128	419	150	124	141	84	317	533
2025	1729	328	911	1367	253	260	133	435	155	136	146	86	339	597

IDE ASSOCIATES, INC.

TABLE 4.A.7a—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—LOW GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS, PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA CENTRE			PARTICIPANTS											
1974	70959	69946	71971	52677	33113	30740	13855	41261	25991	13126	11518	24508	32726	29175
1985	73773	70157	72522	53098	35480	30841	13901	41271	25930	12518	11556	24247	36479	33985
1995	77591	71907	74161	55069	38220	31736	14304	42179	26607	12412	11892	24866	40089	38696
2005	80028	72838	75084	55788	40404	32343	14577	42501	26975	12233	12119	25062	42839	42754
2015	81964	73659	75776	56800	42018	32816	14791	42891	27340	12321	12297	25552	44833	45750
2025	83518	74435	76529	57418	43312	33258	14990	43261	27644	12294	12462	25765	46402	48059
			ACTIVITY DAYS											
1974	2366	629	1791	3319	308	451	220	726	279	219	343	219	432	654
1985	2587	636	1808	2989	348	452	221	729	279	223	327	205	485	773
1995	2822	649	1812	3063	390	465	228	750	287	242	327	204	535	894
2005	2994	649	1820	3037	426	474	232	764	291	261	327	203	572	1016
2015	3124	652	1830	3096	453	481	235	775	296	279	334	207	599	1110
2025	3224	656	1845	3086	474	487	239	786	299	292	336	207	620	1181
PA CHESTER			PARTICIPANTS											
1974	206338	192193	197325	146861	101155	86855	36825	112730	72345	32744	32610	65875	104486	98207
1985	229483	208387	214842	158696	116145	94277	39972	121803	78061	33304	35396	69721	122960	121494
1995	255022	227871	234371	174327	131843	103581	43917	132747	85470	35256	38890	75753	140946	143684
2005	281405	248882	255872	190152	147972	113653	48187	144416	93473	37974	42671	82588	158579	165431
2015	307828	270564	277820	206668	163346	123941	52549	156612	101775	40738	46534	89805	175417	185076
2025	335001	293408	301120	223671	178746	134699	57110	169512	110437	43552	50573	97057	192220	204003
			ACTIVITY DAYS											
1974	7397	1694	4655	9092	994	1272	585	1985	783	620	868	544	1359	2161
1985	8592	1849	5063	8779	1210	1381	635	2155	846	723	889	544	1614	2792
1995	9402	2010	5423	9637	1419	1517	697	2367	928	856	948	577	1855	3385
2005	10989	2170	5902	10424	1625	1665	765	2597	1017	991	1039	632	2085	4000
2015	12128	2345	6394	11151	1813	1816	835	2832	1108	1106	1133	685	2306	4527
2025	13266	2534	6919	11860	1996	1973	907	3078	1203	1213	1224	736	2527	5016
PA CLINTON			PARTICIPANTS											
1974	25173	25298	25810	18011	11788	11333	5212	14580	9371	4130	4241	8037	11417	9753
1985	25874	24811	25410	17854	12545	11138	5122	14241	9147	3787	4167	7798	12797	11527
1995	26164	24283	24811	17774	13057	10950	5036	13892	8962	3590	4097	7684	13664	12879
2005	26313	24389	24915	17731	13191	11044	5079	13897	9012	3548	4132	7680	13812	13037
2015	26282	23844	24330	17523	13505	10825	4978	13559	8822	3430	4051	7585	14322	14100
2025	26015	23247	23704	17183	13619	10580	4866	13192	8608	3299	3959	7626	14570	14769
			ACTIVITY DAYS											
1974	820	220	608	1145	104	166	83	271	102	71	111	70	151	199
1985	899	217	598	999	119	163	82	267	99	69	102	63	170	240
1995	952	211	574	983	130	161	80	262	97	73	98	60	182	276
2005	960	209	574	975	131	162	81	264	98	72	99	60	184	280
2015	990	203	560	941	140	159	79	259	96	78	97	59	192	318
2025	1003	198	545	901	145	155	77	253	94	82	94	57	195	343
PA COLUMBIA			PARTICIPANTS											
1974	37501	37788	38537	26498	17624	16934	7832	21623	13926	5999	6329	11756	17096	14557
1985	39171	37672	38547	26725	19044	16919	7825	21471	13823	5611	6323	11605	19386	17389
1995	41023	38159	38958	27558	20519	17215	7961	21677	14018	5497	6433	11846	21417	20086
2005	42552	38699	39514	28144	21850	17527	8106	21897	14226	5480	6550	12094	23143	22623
2015	43803	39202	39981	28702	22922	17808	8236	22126	14431	5471	6655	12336	24527	24686
2025	44733	39654	40409	29121	23724	18052	8349	22341	14610	5466	6746	12499	25507	26200
			ACTIVITY DAYS											
1974	1222	325	909	1653	156	246	125	408	151	103	168	102	226	294
1985	1358	326	910	1471	179	248	125	407	150	104	153	93	258	359
1995	1488	328	903	1494	202	253	127	414	152	113	151	92	285	428
2005	1597	329	913	1493	225	257	129	422	155	124	153	93	309	504
2015	1686	331	921	1487	243	261	131	429	157	134	156	94	328	567
2025	1749	334	929	1484	257	265	133	434	159	143	157	94	342	615
PA HARRISBURG SMSA			PARTICIPANTS											
1974	292804	281200	288336	205545	140906	124803	54882	161807	103131	45233	46568	91047	142462	128081
1985	308710	287678	295989	210666	153079	127881	56236	164961	105042	43563	47716	91505	159783	150522
1995	327107	298438	306399	220551	165843	133217	58582	170603	109084	43737	49707	94834	175945	171515
2005	342788	308206	316389	228074	177147	138189	60769	175452	112767	44395	51563	98083	189514	189764
2015	358095	319179	327352	236643	188442	143524	63115	181243	116914	45223	53553	101574	202299	207561
2025	371547	327983	336103	243288	197184	147865	65024	185838	120243	45829	55173	104269	212298	221008
			ACTIVITY DAYS											
1974	10095	2443	6786	12420	1322	1832	872	2946	1116	818	1209	756	1845	2684
1985	11161	2515	6969	11385	1519	1877	893	3018	1137	870	1170	714	2090	3264
1995	12217	2594	7082	11870	1710	1955	931	3144	1182	969	1183	719	2313	3814
2005	13093	2648	7287	12075	1876	2028	965	3262	1225	1055	1224	743	2495	4345
2015	13933	2727	7517	12262	2041	2106	1003	3388	1271	1169	1267	764	2662	4889
2025	14586	2790	7710	12370	2166	2170	1033	3490	1309	1248	1300	779	2795	5286
PA LACKAWANNA			PARTICIPANTS											
1974	155082	154571	157653	106474	73856	67246	32271	84551	54900	22847	24912	46253	73057	63492
1985	160072	152785	156240	106501	78762	66620	31971	85224	54057	21222	24679	45376	81306	74263
1995	164230	152051	155153	107598	83036	66623	31972	84487	53850	20419	24681	45387	87632	83367
2005	167061	151496	154608	108164	86437	66546	31935	83952	53686	20103	24652	45662	92357	91230
2015	168860	150913	153619	108491	88866	66461	31894	83452	53552	19793	24620	45828	95736	97079
2025	170884	151277	154061	108894	91087	66809	32062	83443	53722	19501	24750	45900	98558	101713
			ACTIVITY DAYS											
1974	5167	1319	3682	6282	670	989	514	1681	594	413	619	386	967	1278
1985	5651	1306	3651	5557	759	980	509	1666	585	418	579	393	1082	1541
1995	6048	1290	3571	5541	835	980	509	1666	584	447	562	340	1169	1783
2005	6341	1275	3546	5466	903	979	508	1664	583	486	562	341	1234	2039
2015	6550	1264	3522	5371	953	978	508	1662	582	517	562	339	1281	2233
2025	6724	1261	3524	5262	994	983	510	1670	584	543	561	336	1320	2383

IOE ASSOCIATES, INC.

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AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA LANCASTER			PARTICIPANTS											
1974	227438	219209	223971	161223	108821	96642	44508	126101	80129	36078	36048	71816	109977	98262
1985	245572	229922	235765	169044	121078	101552	46769	131756	83659	35536	37879	73787	126239	118254
1995	270841	248313	254022	184109	136643	110181	50743	141812	90455	37124	41098	79539	144796	140480
2005	286481	258470	264823	192215	147275	115341	53120	147251	94384	38047	43023	83050	157408	156867
2015	300854	268762	274543	200140	157186	120158	55338	152468	98148	38978	44819	86441	168750	172294
2025	312966	277550	283382	206736	165201	124348	57268	157151	101416	39698	46382	89103	177831	184394
			ACTIVITY DAYS											
1974	7817	1913	5292	9990	1016	1419	708	2332	866	638	954	602	1451	2047
1985	8841	2018	5568	9374	1196	1491	744	2451	904	694	944	583	1679	2592
1995	10077	2166	5891	10162	1403	1617	807	2659	979	804	994	610	1933	3111
2005	10899	2233	6117	10434	1553	1693	845	2783	1024	883	1038	636	2104	3578
2015	11647	2304	6329	10676	1697	1764	881	2899	1066	978	1081	659	2255	4040
2025	12245	2371	6525	10807	1809	1825	911	3091	1102	1053	1113	675	2375	4399
PA LEBANON			PARTICIPANTS											
1974	70577	68327	69808	49596	33733	30556	14059	39313	25207	10934	11427	21882	33789	29743
1985	72875	68247	69956	49757	35956	30568	14065	39131	25071	10274	11432	21553	37395	34665
1995	76347	69910	71501	51471	38586	31456	14473	39951	25711	10185	11764	22082	40882	39361
2005	78713	70939	72556	52324	40645	32057	14750	40370	26112	10147	11989	22443	43464	43197
2015	80828	71945	73498	53292	42508	32545	14997	40857	26520	10168	12190	22838	45617	46721
2025	82475	72852	74382	53908	43915	33104	15231	41263	26873	10107	12380	23043	47265	49237
			ACTIVITY DAYS											
1974	2399	595	1641	3025	309	448	224	732	273	193	292	183	449	607
1985	2614	597	1644	2706	351	448	224	733	272	199	276	168	498	734
1995	2838	608	1651	2786	393	461	230	754	279	219	275	167	547	859
2005	3001	610	1669	2776	427	470	235	768	284	237	280	170	583	977
2015	3140	615	1687	2778	459	478	239	781	289	263	285	172	611	1096
2025	3245	620	1705	2743	482	486	242	793	293	277	287	172	633	1176
PA LEHIGH & NORTHAMPTON			PARTICIPANTS											
1974	320388	317505	324708	224327	152459	141225	65118	181447	116110	49372	52704	98673	150875	132051
1985	345775	330830	339406	235003	169436	147586	67958	188418	120484	48393	55003	101309	173710	159211
1995	372778	347338	355528	249821	187112	155455	71679	197133	126649	49140	58014	106643	195688	185970
2005	398589	364801	373412	261832	203922	163818	75535	206365	133115	50861	61135	112655	215824	211056
2015	424383	383038	391633	276750	220673	172416	79500	216262	139966	52834	64344	119103	235263	236117
2025	447560	399860	408483	291622	235745	180476	83216	225241	146235	54295	67351	124375	252708	258259
			ACTIVITY DAYS											
1974	10729	2745	7614	13512	1389	2073	1036	3406	1258	871	1330	828	1998	2696
1985	12157	2876	7957	12602	1629	2163	1081	3554	1306	936	1312	798	2310	3355
1995	13601	3000	8197	13257	1871	2281	1141	3769	1375	1047	1345	813	2609	4017
2005	14920	3121	8575	13767	2101	2406	1202	3950	1448	1159	1415	855	2881	4700
2015	16207	3261	8976	14261	2334	2530	1265	4158	1524	1301	1493	897	3142	5417
2025	17355	3390	9349	14592	2540	2649	1324	4352	1593	1420	1554	927	3377	6036
PA LUZERNE			PARTICIPANTS											
1974	225176	226226	230887	154673	106915	97542	47199	126259	79647	33134	36060	67073	105343	91377
1985	231333	222073	227269	153841	113628	95957	46432	123473	77871	30547	35476	65406	117165	107069
1995	239058	222317	226992	156628	120730	96499	46695	123173	78044	29611	35675	65955	127347	121445
2005	243211	221482	226169	157472	125664	96366	46630	122392	77798	29158	35625	66348	134207	132876
2015	246366	221244	225665	158279	129291	96506	46698	121998	77813	28779	35677	66718	139161	141075
2025	247715	220395	224692	158176	131504	96336	46616	121321	77570	28350	35614	66573	142164	146490
			ACTIVITY DAYS											
1974	7665	1925	5379	9088	967	1436	751	2460	861	595	896	560	1398	1833
1985	8150	1899	5301	7960	1094	1412	739	2420	842	601	831	507	1563	2220
1995	8795	1888	5213	8007	1217	1420	743	2434	845	653	813	493	1702	2604
2005	9221	1866	5176	7899	1317	1418	742	2430	844	711	813	493	1796	2979
2015	9529	1855	5154	7781	1389	1420	743	2434	845	754	815	492	1864	3245
2025	9712	1842	5128	7637	1436	1418	742	2430	842	786	810	486	1905	3429
PA LYCOMING			PARTICIPANTS											
1974	76415	75427	76941	54038	36283	33531	15465	43210	27650	12106	12514	23923	35853	31297
1985	77952	73710	75438	53309	38379	32839	15145	42058	26904	11099	12256	23138	39718	36712
1995	79944	73470	75022	53909	40465	32870	15160	41793	26847	10735	12267	23167	42767	41317
2005	81298	73230	74780	53995	42237	32895	15171	41492	26783	10526	12277	23187	45103	45391
2015	82034	72983	74443	54016	43297	32879	15164	41251	26727	10337	12271	23180	46494	47889
2025	82078	72451	73847	53661	43789	32721	15091	40863	26553	10119	12212	22992	47178	49292
			ACTIVITY DAYS											
1974	2558	653	1809	3306	329	492	246	809	299	212	323	203	473	638
1985	2779	641	1774	2959	373	482	241	792	291	214	298	183	529	776
1995	2971	635	1735	2966	413	482	241	793	291	233	290	177	572	906
2005	3115	626	1723	2912	448	483	241	793	291	256	290	177	603	1045
2015	3200	621	1711	2853	470	483	241	793	291	271	289	175	622	1130
2025	3239	614	1696	2777	482	480	240	789	289	279	287	173	631	1181
PA MONROE			PARTICIPANTS											
1974	31284	32988	33675	22343	14490	14984	6770	18958	12297	5175	5615	9919	13466	11137
1985	34537	34858	35692	23865	16406	15867	7169	19956	12941	5140	5946	10326	15882	13614
1995	38321	37614	38220	26078	18676	17108	7730	21348	13908	5339	6411	11166	18640	16629
2005	42301	40207	41082	28349	21059	18449	8336	22861	14956	5640	6913	12173	21608	19923
2015	46118	42991	43879	30614	23359	19780	8937	24392	16012	5959	7412	13153	24349	23079
2025	50356	46203	47102	33101	25931	21325	9635	26146	17228	6303	7991	14201	27321	26540
			ACTIVITY DAYS											
1974	976	284	793	1419	123	220	108	354	134	87	141	87	179	221
1985	1129	302	841	1342	145	233	114	375	141	91	141	85	210	272
1995	1312	322	885	1449	172	251	123	405	151	102	148	89	247	330
2005	1506	343	947	1530	203	270	133	436	163	111	159	95	288	415
2015	1687	364	1010	1616	232	290	142	468	175	124	170	101	325	495
2025	1884	390	1082	1707	264	313	153	504	188	141	182	108	365	585

IDE ASSOCIATES, INC.

TABLE 4.A.7a--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA MONTGOMERY			PARTICIPANTS											
1974	450340	415372	424976	312330	225042	189138	83159	240712	155890	66484	70985	130075	235066	223935
1985	438576	396335	406985	296158	225648	180714	79455	228887	148068	59368	67823	128022	239890	239322
1995	500710	446407	457434	334805	262540	204385	89862	257046	166463	64943	76707	143279	281209	288658
2005	520216	463368	474780	344840	273940	213097	93693	265701	173496	66230	79977	147813	293464	301458
2015	545181	481607	492902	359306	290459	222001	97608	275664	180576	68202	83319	154069	311985	326160
2025	641381	563939	576826	419989	344633	260572	114567	322125	211592	78714	97795	179713	370160	390990
			ACTIVITY DAYS											
1974	16483	3607	9929	18590	2246	2771	1322	4399	1693	1317	1794	1114	3105	4910
1985	16646	3465	9495	15793	2371	2648	1263	4203	1609	1368	1613	976	3187	5489
1995	19441	3880	10501	17896	2840	2994	1429	4754	1817	1668	1776	1069	3742	6786
2005	20242	3981	10864	18253	2963	3122	1490	4956	1892	1703	1849	1111	3905	7087
2015	21475	4118	11258	18778	3195	3252	1552	5164	1971	1861	1931	1155	4151	7826
2025	25433	4803	13162	21545	3822	3818	1822	6061	2311	2243	2255	1341	4920	9489
PA MONTOUR			PARTICIPANTS											
1974	11562	11653	11861	7979	5528	5193	2440	6567	4229	1729	1933	3471	5400	4687
1985	11402	10994	11221	7616	5628	4911	2307	6171	3974	1529	1828	3245	5746	5237
1995	11827	11050	11756	7790	5988	4953	2327	6185	3998	1483	1844	3282	6259	5939
2005	11420	10445	[illegible]	7407	5915	4697	2206	5825	3779	1372	1749	3117	6267	6166
2015	11646	10495	10692	7501	6127	4726	2220	5845	3801	1364	1760	3158	6549	6607
2025	11788	10513	10698	7521	6283	4751	2232	5837	3811	1336	1769	3155	6750	6930
			ACTIVITY DAYS											
1974	383	99	277	480	50	76	39	127	46	31	47	29	72	94
1985	400	94	262	405	54	72	37	120	43	30	42	25	77	108
1995	433	94	258	409	60	73	37	121	43	32	41	25	84	126
2005	431	88	242	381	61	69	35	115	41	33	39	23	84	137
2015	449	88	243	378	65	69	35	116	41	35	39	23	88	151
2025	461	87	242	371	68	70	36	116	42	37	39	23	91	161
PA NORTHUMBERLAND			PARTICIPANTS											
1974	63171	65233	66512	43896	29744	29294	13656	36913	23849	9628	10930	19062	28433	23978
1985	66001	64499	65437	44263	32187	29023	13530	36369	23494	8949	10829	18822	32432	28902
1995	69017	64845	66145	45638	34686	29274	13647	36480	23645	8757	10923	19214	35967	33677
2005	71098	65161	66482	46260	36660	29524	13764	36522	23776	8652	11016	19495	38683	37731
2015	72677	65498	66750	46926	38125	29743	13866	36644	23930	8608	11098	19809	40710	40791
2025	73616	65613	66802	47182	39143	29868	13924	36634	23993	8512	11145	19887	42031	42954
			ACTIVITY DAYS											
1974	2030	555	1548	2676	260	430	217	710	259	169	263	162	380	471
1985	2267	552	1535	2370	300	426	215	704	255	171	247	148	432	586
1995	2494	553	1518	2399	340	430	217	710	257	187	243	145	480	709
2005	2664	550	1520	2376	375	433	219	716	259	203	244	146	517	831
2015	2791	550	1524	2357	402	437	221	721	261	217	247	147	546	925
2025	2874	549	1525	2319	421	438	222	726	262	229	247	144	564	995
PA PHILADELPHIA & DELAWARE			PARTICIPANTS											
1974	1610776	1551865	1606896	1125274	764407	626351	251880	868845	520663	247460	227738	496488	783612	709246
1985	1709222	1599719	1663539	1162358	834367	646582	260015	892727	534285	241086	235094	503076	879021	829967
1995	1760760	1612425	1673047	1181561	878826	654726	263290	896493	538952	234280	238055	505595	939986	916236
2005	1805627	1628017	1689407	1195729	917780	663749	266919	901403	544447	232457	241335	511561	990355	989246
2015	1856007	1653065	1713645	1220029	957224	675542	271661	913428	553470	233439	245624	521827	1038289	1059874
2025	1858236	1640781	1699446	1213041	968632	672178	270308	904700	549753	228615	244400	517861	1054191	1091337
			ACTIVITY DAYS											
1974	55532	13380	37966	67467	7329	9264	3969	15146	5552	4485	6341	4077	9483	14933
1985	61455	13877	39295	62560	8406	9563	4097	15635	5698	4865	6193	3895	10772	18068
1995	65313	13902	38805	63034	9163	9684	4149	15832	5759	5221	6063	3791	11598	20396
2005	68458	13878	39001	62808	9811	9817	4206	16050	5832	5525	6127	3830	12263	22597
2015	71549	14026	39479	62947	10453	9992	4281	16335	5934	5955	6241	3880	12880	24811
2025	72463	13867	39090	61490	10723	9942	4259	16254	5898	6144	6179	3820	13090	25924
PA PIKE			PARTICIPANTS											
1974	8531	8584	8723	5801	4158	3991	1811	4864	3218	1224	1497	2495	4052	3553
1985	9547	9217	9382	6279	4799	4302	1952	5196	3445	1222	1614	2640	4866	4468
1995	10686	10007	10156	6901	5513	4701	2133	5613	3746	1257	1763	2858	5714	5444
2005	11840	10867	11028	7512	6239	5131	2328	6064	4071	1319	1925	3100	6550	6435
2015	13056	11812	11971	8203	6986	5597	2540	6571	4431	1403	2100	3380	7401	7435
2025	14417	12907	13060	8962	7816	6143	2787	7154	4849	1488	2304	3674	8323	8490
			ACTIVITY DAYS											
1974	286	72	203	342	37	58	29	94	35	23	34	21	54	71
1985	338	78	218	328	46	63	31	102	38	25	35	20	65	92
1995	394	84	231	355	55	69	34	111	41	29	36	21	77	115
2005	448	90	248	378	64	75	37	121	45	33	39	22	88	140
2015	505	97	268	403	73	82	40	132	49	38	42	24	99	166
2025	566	105	292	429	83	90	44	145	53	43	46	26	112	193
PA SCHUYLKILL			PARTICIPANTS											
1974	111799	104809	106869	74952	55773	45613	21984	58496	37143	15146	16890	32378	38321	34846
1985	103738	105432	107788	69837	49447	45978	22160	58630	37219	14299	17025	29526	48293	41651
1995	107732	106989	109217	71709	52125	46856	22583	59304	37794	14297	17350	30193	52132	45782
2005	111520	107899	110113	72634	55147	47571	22928	59411	38142	13846	17615	30450	56402	50908
2015	116237	109356	111470	74824	58791	48355	23306	60063	38705	13860	17905	31385	61337	57413
2025	123366	110630	112666	77852	65460	49078	23455	60591	39188	13810	18173	32549	70427	71462
			ACTIVITY DAYS											
1974	4057	888	2476	4213	553	671	350	1144	402	306	412	257	779	1171
1985	3406	898	2498	3786	443	676	353	1153	403	269	392	238	643	824
1995	3648	905	2517	3884	478	689	359	1175	410	271	392	239	695	904
2005	3909	898	2508	3829	522	700	365	1193	415	272	390	236	753	1021
2015	4225	904	2535	3837	578	711	371	1213	421	293	396	239	819	1196
2025	4802	910	2563	3807	702	722	377	1231	427	369	399	240	945	1634

EDE ASSOCIATES, INC.

TABLE 4.A.7a--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM-MING	PICNIC-KING	SS, PLEAS DRIVE	BICYC-LING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
PA SNYDER			PARTICIPANTS											
1974	20684	20707	21171	14924	9699	9325	4229	12034	7740	3482	3498	6719	9434	8141
1985	22559	21566	22135	15710	10962	9727	4411	12488	8022	3407	3648	6926	11202	10219
1995	24820	22981	23526	17001	12422	10417	4724	13259	8561	3501	3907	7406	13002	12417
2005	26940	24423	24999	18171	13842	11120	5042	14035	9107	3662	4171	7910	14671	14592
2015	28939	25849	26469	19355	15110	11821	5360	14843	9668	3830	4434	8626	16134	16435
2025	30004	26612	27192	19933	15844	12175	5521	15231	9944	3888	4567	8661	16988	17587
			ACTIVITY DAYS											
1974	678	181	505	945	87	137	67	220	84	59	93	58	125	169
1985	789	190	528	877	105	143	70	230	87	63	92	56	149	218
1995	908	201	549	939	125	153	75	246	93	72	95	58	174	273
2005	1018	211	582	986	145	163	80	263	99	84	101	62	196	335
2015	1115	223	614	1030	162	173	85	279	105	94	107	65	216	387
2025	1171	228	630	1041	173	178	88	288	108	101	110	66	228	421
PA SULLIVAN			PARTICIPANTS											
1974	3715	3849	3954	2655	1763	1796	808	2235	1467	610	674	1179	1675	1448
1985	3881	3865	3943	2667	1904	1788	804	2212	1452	569	671	1155	1881	1711
1995	4054	3880	3947	2730	2048	1805	812	2212	1459	549	678	1164	2079	1971
2005	3479	3246	3302	2302	1796	1517	683	1841	1222	447	570	980	1859	1812
2015	3563	3258	3310	2332	1870	1528	688	1843	1229	441	576	995	1968	1965
2025	3620	3265	3314	2346	1928	1537	691	1843	1233	434	577	997	2044	2080
			ACTIVITY DAYS											
1974	121	33	93	174	16	26	13	42	16	10	17	10	23	29
1985	133	33	93	154	18	26	13	42	16	11	16	9	25	36
1995	145	33	91	155	20	26	13	42	16	12	15	9	28	43
2005	129	27	75	127	18	22	11	36	13	10	13	8	25	40
2015	136	27	75	126	19	22	11	36	13	11	13	8	26	44
2025	140	27	75	124	20	23	11	36	14	11	13	8	27	48
PA SUSQUEHANNA			PARTICIPANTS											
1974	23762	24087	24554	17008	11181	10765	4978	13835	8878	3898	4024	7550	10845	9364
1985	25144	24423	24980	17394	12214	10937	5057	13976	8963	3717	4088	7557	12359	11202
1995	28178	26508	27045	19170	14061	11930	5516	15112	9741	3885	4459	8227	14570	13745
2005	31081	28622	29203	20795	15871	12941	5984	16243	10527	4106	4837	8921	16684	16277
2015	33914	30745	31328	22486	17611	13942	6447	17404	11325	4349	5211	9651	18708	18717
2025	36567	32790	33386	24032	19237	14911	6894	18517	12087	4559	5573	10290	20555	20930
			ACTIVITY DAYS											
1974	780	209	577	1099	100	158	79	259	96	67	103	65	145	191
1985	871	213	586	999	116	160	80	263	97	70	99	61	165	235
1995	1019	229	624	1087	139	175	88	287	106	81	105	64	195	295
2005	1158	245	670	1151	162	190	95	311	115	93	113	69	223	362
2015	1293	261	717	1218	185	205	103	335	123	105	122	74	251	427
2025	1415	277	763	1272	206	219	110	359	132	117	129	78	276	487
PA UNION			PARTICIPANTS											
1974	19918	19743	20234	14293	9386	8903	3957	11499	7391	3309	3340	6434	9242	8073
1985	22120	21076	21674	15364	10758	9519	4231	12232	7855	3320	3572	6765	10996	10077
1995	23615	21846	22413	16154	11794	9912	4405	12637	8152	3322	3719	7032	12303	11728
2005	24839	22538	23092	16704	12709	10300	4578	12961	8427	3346	3865	7261	13426	13208
2015	26126	23392	23969	17515	13541	10682	4747	13458	8750	3481	4008	7640	14440	14545
2025	26401	23438	24001	17576	13849	10727	4767	13459	8773	3437	4025	7650	14837	15207
			ACTIVITY DAYS											
1974	661	174	485	874	86	130	63	208	80	57	89	55	122	170
1985	773	186	519	834	104	139	67	223	85	63	90	55	145	218
1995	859	192	526	866	118	145	70	232	88	70	91	55	163	259
2005	930	195	540	880	131	151	73	241	92	76	93	56	178	300
2015	998	203	560	910	144	157	76	250	95	83	98	59	192	339
2025	1023	202	559	896	149	157	76	251	96	86	97	58	197	361
PA WAYNE			PARTICIPANTS											
1974	20800	21321	21697	14511	9897	9698	4435	12125	7893	3199	3628	6317	9522	8185
1985	22582	21976	22421	15185	11122	10026	4585	12444	8106	3084	3750	6458	11216	10149
1995	24501	22970	23401	16224	12408	10508	4805	12978	8477	3120	3930	6823	12848	12163
2005	27479	25165	25682	17969	14217	11521	5268	14192	9284	3388	4309	7577	14973	14703
2015	30507	27479	28017	19776	16047	12609	5766	15464	10150	3649	4717	8348	17102	17221
2025	29460	26255	26769	18974	15680	12060	5515	14759	9700	3448	4511	8002	16805	17240
			ACTIVITY DAYS											
1974	679	182	506	903	88	142	71	232	86	57	87	54	127	164
1985	784	188	523	833	105	147	73	239	88	61	85	51	149	209
1995	892	196	536	875	123	154	76	251	92	69	86	51	171	259
2005	1033	213	586	945	146	169	84	275	101	81	95	57	200	327
2015	1174	231	638	1014	170	185	92	301	111	93	104	62	229	393
2025	1151	220	609	950	169	177	88	288	106	93	99	59	225	401
PA WYOMING			PARTICIPANTS											
1974	13448	13664	13939	9656	6315	6188	2818	7899	5104	2229	2321	4297	6102	5229
1985	14803	14398	14738	10267	7182	6532	2974	8294	5355	2208	2449	4471	7239	6532
1995	15770	14842	15162	10772	7858	6758	3077	8526	5525	2206	2534	4639	8114	7637
2005	16640	15311	15634	11167	8501	7010	3192	8751	5707	2226	2629	4805	8916	8695
2015	17187	15544	15853	11425	8940	7137	3250	8864	5802	2229	2676	4919	9488	9509
2025	18334	16396	16712	12086	9664	7546	3436	9330	6124	2317	2830	5194	10321	10945
			ACTIVITY DAYS											
1974	439	119	330	619	56	91	45	147	55	38	59	37	82	106
1985	510	126	349	583	68	96	47	155	58	41	59	36	97	137
1995	568	129	352	606	7	99	49	160	60	46	60	36	108	164
2005	619	132	362	611	87	103	51	166	62	50	61	37	119	194
2015	656	133	366	611	94	105	52	169	63	54	63	38	127	218
2025	711	140	385	631	104	111	55	179	67	59	66	39	138	247

IDE ASSOCIATES, INC.

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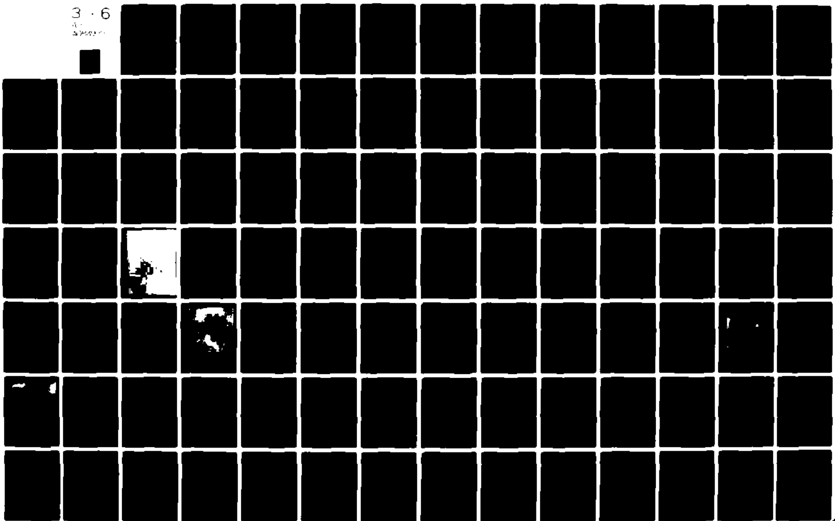

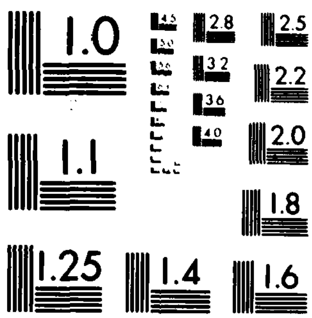

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TABLE 4.A.7a—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS, PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA YORK			PARTICIPANTS											
1974	193506	165726	169921	135676	93368	83353	37542	107009	68729	29732	31185	59934	96341	84469
1985	218568	203649	208947	149153	108713	91466	41196	116994	75027	30706	34220	64668	113497	106897
1995	235103	214657	219793	158430	119683	96868	43629	122889	79176	31326	36241	68009	126988	124018
2005	246905	222273	227600	164075	128193	100773	45388	126693	82054	31854	37702	70378	137077	137635
2015	258658	230415	235659	170889	136257	104625	47123	131176	85179	32703	39143	73283	146039	150329
2025	268671	237636	242866	176198	143033	108185	48726	134984	87915	33205	40475	75392	153706	160500
			ACTIVITY DAYS											
1974	6683	1614	4465	8224	870	1222	597	1976	745	532	795	496	1239	1747
1985	7928	1782	4911	8081	1077	1341	655	2168	813	610	826	503	1506	2306
1995	8814	1866	5077	8556	1234	1421	694	2296	859	695	849	514	1693	2753
2005	9466	1910	5239	8725	1359	1478	722	2389	893	763	879	532	1829	3152
2015	10064	1974	5410	8925	1478	1534	750	2480	927	854	916	551	1946	3551
2025	10566	2027	5569	9014	1573	1586	775	2565	958	915	942	563	2048	3849
NJ TOTAL			PARTICIPANTS											
1974	4738120	4451925	4578299	3309418	2317902	1949763	840560	2558612	1614234	717290	725349	1462764	2400908	2241996
1985	5175729	4761681	4892655	3522594	2608530	2079874	895903	2717616	1712758	720688	773850	1525866	2761781	2703668
1995	5501354	4956365	5103967	3702963	2829201	2183802	940867	2832703	1792728	729702	812630	1586415	3025071	3051711
2005	5826654	5185974	5339735	3872551	3048524	2296029	989498	2952289	1878398	749625	854503	1658134	3277369	3382292
2015	6151368	5435723	5590963	4062580	3249980	2414431	1040765	3088517	1572607	775663	898726	1739367	3501256	3660814
2025	6466055	5686603	5845100	4245579	3439451	2533242	1092191	3225301	2066376	799900	943106	1815484	3712096	3911483
			ACTIVITY DAYS											
1974	169232	38799	107464	197912	22753	28642	13337	45948	17427	13661	18913	11892	31012	48482
1985	192413	41600	114796	189480	27002	30552	14215	48981	18494	15749	19100	11729	35918	61109
1995	209815	43260	117673	198732	30209	32077	14929	51416	19393	17783	19463	11890	39448	70674
2005	226334	44764	122646	204312	33278	33724	15701	54047	20364	19553	20391	12428	42780	80274
2015	241271	46691	128108	210824	35907	35461	16515	56816	21409	21208	21435	12985	45701	88134
2025	255311	48666	133712	216314	38285	37205	17331	59592	22446	22572	22380	13673	48475	94874
NJ BERGEN			PARTICIPANTS											
1974	648731	596424	610978	444655	326671	270882	120355	343958	222528	92461	101568	195132	343294	330368
1985	682872	617270	634429	457478	352645	280520	124637	355051	229342	90189	105182	196613	375361	376339
1995	720200	643123	659425	477963	378462	293318	130323	368923	239157	91143	109980	203296	405281	417286
2005	756798	670495	687674	497472	402671	306490	136398	383281	249626	93752	115106	211751	432430	452348
2015	794094	700160	717271	519788	425395	321276	142745	399565	261033	97025	120463	221443	457163	482612
2025	824328	728870	746269	539629	446641	335239	148949	415078	271899	99324	125699	229438	480525	510024
			ACTIVITY DAYS											
1974	23975	5163	14205	25405	3301	3970	1914	6346	2418	1882	2513	1552	4560	7287
1985	25947	5382	14738	23802	3724	4111	1982	6572	2493	2128	2465	1486	5001	8664
1995	27979	5580	15082	24852	4104	4299	2073	6872	2603	2393	2510	1504	5405	9837
2005	29765	5759	15676	25617	4432	4499	2169	7192	2722	2586	2628	1573	5765	10853
2015	31425	5987	16320	26478	4720	4708	2270	7527	2849	2772	2758	1644	6090	11702
2025	32974	6210	16954	26935	4981	4913	2369	7854	2970	2916	2858	1691	6400	12428
NJ ESSEX			PARTICIPANTS											
1974	577736	550180	571600	403471	277588	225479	86389	310632	187495	88163	82315	177871	286525	265708
1985	648987	600909	626265	441139	320491	246607	94484	338167	203865	90942	90028	190706	338901	326891
1995	671419	608880	633378	450266	338648	250989	96162	341417	206672	88734	91628	192202	362812	360218
2005	689687	616940	641805	456379	353701	255380	97845	344672	209520	88059	93231	194623	381682	387050
2015	703743	623620	648154	461642	365164	259010	99236	347172	211985	87455	94556	196539	395703	407159
2025	717157	630979	655265	467561	375263	262694	100647	350530	214673	87294	95901	198900	407904	424076
			ACTIVITY DAYS											
1974	20262	4763	13462	24057	2725	3331	1359	5295	2003	1679	2264	1445	3450	5754
1985	23661	5234	14763	23587	3293	3643	1487	5792	2178	1934	2344	1462	4125	7306
1995	25190	5272	14649	23083	3588	3708	1513	5895	2213	2091	2302	1427	4441	8204
2005	26371	5285	14783	23685	3828	3773	1540	5998	2248	2206	2329	1440	4686	9009
2015	27253	5310	14889	23479	4010	3826	1561	6083	2278	2308	2349	1443	4866	9615
2025	28031	5349	15017	23390	4164	3881	1584	6169	2308	2395	2375	1451	5023	10116
NJ HUDSON			PARTICIPANTS											
1974	413949	402006	413769	286090	194843	153370	76398	219332	127690	61751	55058	129132	201348	181217
1985	434324	408005	421081	291902	211036	155941	77679	221802	129009	59111	55981	125263	224814	212085
1995	459604	421678	434206	304692	228854	161945	80670	228308	133419	59003	58137	129373	247621	241827
2005	484172	437041	450088	317152	246108	168359	83865	235810	138319	60127	60439	134576	268570	270104
2015	503717	449125	461991	327649	259646	173409	86380	241857	142309	61199	62252	139023	284716	292417
2025	520328	460188	473029	335918	271101	178141	88737	247199	145883	61699	63951	142240	298253	310501
			ACTIVITY DAYS											
1974	14220	3470	9748	16535	1876	2277	1212	4179	1353	1131	1562	1025	2585	3789
1985	15653	3540	9919	15075	2145	2315	1232	4249	1367	1209	1499	964	2911	4599
1995	17134	3633	10055	15624	2413	2404	1280	4413	1417	1346	1507	965	3218	5380
2005	18495	3733	10379	15921	2671	2499	1331	4588	1472	1491	1563	999	3496	6210
2015	19553	3819	10634	16195	2876	2574	1370	4725	1516	1625	1612	1026	3709	6880
2025	20430	3898	10874	16227	3043	2645	1408	4854	1555	1724	1645	1040	3887	7407
NJ HUNTERDON			PARTICIPANTS											
1974	53176	49913	51000	37281	26205	22828	10133	29028	18833	8078	8581	16474	26974	25104
1985	58925	53851	55216	40156	30007	24666	10949	31208	20233	8178	9272	17385	31660	31071
1995	66181	59456	60835	44623	34429	27338	12135	34362	22364	8773	10276	19126	36706	37248
2005	73929	65695	67215	49232	39123	30334	13465	37819	24737	9527	11402	21091	41846	43480
2015	82084	72439	74030	54373	43836	33525	14881	41626	27316	10399	12602	23315	47002	49461
2025	90403	79451	81142	59502	48592	36867	16365	45552	29985	11227	13858	25482	52185	55293
			ACTIVITY DAYS											
1974	1903	436	1192	2280	254	334	161	531	205	153	216	134	358	538
1985	2205	473	1290	2195	309	361	174	574	220	188	220	134	423	700
1995	2545	519	1398	2436	368	400	193	636	243	217	238	144	491	865
2005	2890	568	1540	2645	427	444	214	706	270	254	264	159	559	1038
2015	3240	623	1692	2879	484	491	237	780	298	290	292	175	628	1197
2025	3590	680	1854	3086	540	540	260	858	327	322	320	190	697	1367

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TABLE 4.A.7a—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ MERCER			PARTICIPANTS											
1974	221616	208147	215027	154449	108117	91704	37346	120018	75851	33542	34125	68686	111624	103656
1985	242280	221566	229482	164454	121919	97581	39740	127290	80293	33691	36310	71353	120973	125676
1995	265483	238260	246227	177896	136630	105430	42936	136393	86430	34900	39231	76233	146175	147199
2005	289253	256381	264950	191192	151587	113993	46424	146109	93079	36818	42617	81000	163058	168162
2015	314076	276254	285241	206126	166297	123196	50155	157068	100416	39088	45826	88180	179338	187529
2025	338382	296111	305528	220691	180476	132336	53894	168000	107705	41222	49242	96194	195028	205668
			ACTIVITY DAYS											
1974	7863	1811	5075	9075	1053	1347	591	2106	819	628	892	556	1418	2228
1985	8976	1940	5414	8681	1257	1433	629	2242	867	726	899	548	1645	2834
1995	10122	2074	5697	9351	1457	1549	680	2422	935	847	938	568	1871	3485
2005	11242	2204	6104	9902	1654	1674	735	2619	1009	961	1008	610	2090	3990
2015	12334	2362	6555	10459	1838	1809	794	2829	1090	1073	1089	655	2299	4517
2025	13387	2523	7004	11001	2011	1944	853	3040	1170	1173	1161	694	2501	4991
NJ MIDDLESEX			PARTICIPANTS											
1974	428860	398286	409198	305062	209570	178226	77965	233241	148698	67521	66842	136597	218233	204238
1985	457676	415715	428903	317409	230973	185957	81347	242902	154430	66513	69741	139210	245373	242826
1995	490283	438950	451870	336481	252729	197152	86244	255738	163253	68053	73940	145970	270680	276951
2005	520939	462031	475504	352640	273136	208664	91280	267879	172048	70205	78257	152842	293357	306616
2015	553924	488783	502506	373051	292737	221265	96792	282859	182255	73425	82983	161668	314444	332273
2025	587841	516967	531264	393522	312359	234549	102603	298559	192877	76445	87965	170290	335908	356986
			ACTIVITY DAYS											
1974	15436	3530	9633	18634	2061	2612	1239	4143	1609	1242	1777	1119	2874	4433
1985	17163	3717	10084	17451	2416	2725	1293	4323	1671	1439	1756	1081	3294	5581
1995	18851	3904	10420	18529	2735	2889	1371	4583	1770	1663	1810	1109	3597	6556
2005	20344	4056	10927	19138	3013	3058	1651	4851	1869	1834	1905	1165	3896	7427
2015	21772	4271	11516	19974	3258	3242	1539	5144	1982	2001	2023	1230	4170	8151
2025	23215	4501	12152	20656	3495	3437	1631	5452	2099	2138	2132	1288	4494	8804
NJ MONMOUTH			PARTICIPANTS											
1974	336710	316199	324270	238002	165265	142198	60532	184007	117859	52497	53294	105704	170344	159705
1985	355348	325319	334630	244219	179724	146506	62365	188658	120716	50733	54868	106176	189428	185499
1995	380476	342169	351424	258583	196390	154749	65876	197856	127115	51810	57955	111224	209194	211632
2005	404691	359753	369451	271618	212331	163375	69547	207183	133784	93498	61186	116873	227358	235046
2015	428246	377927	387733	285285	226925	172139	73277	217100	140725	55293	64468	122700	243606	255059
2025	450375	395548	405573	298233	240277	180579	76870	226775	147387	57074	67629	128099	258458	272733
			ACTIVITY DAYS											
1974	12045	2770	7622	14772	1621	2085	961	3277	1275	1008	1381	867	2215	3480
1985	13229	2868	7866	13598	1857	2148	990	3376	1307	1114	1343	822	2478	4223
1995	14542	3001	8114	14405	2094	2269	1046	3566	1378	1263	1379	840	2742	4920
2005	15737	3120	8501	14842	2313	2395	1104	3765	1454	1389	1454	884	2982	5595
2015	16818	3259	8896	15282	2501	2524	1163	3967	1531	1503	1529	923	3194	6153
2025	17808	3398	9297	15683	2669	2647	1220	4161	1604	1608	1597	957	3398	6629
NJ MORRIS			PARTICIPANTS											
1974	282837	258988	265580	199299	141092	118160	51767	152137	98135	43216	44686	88480	148320	142708
1985	308425	276981	285108	211836	158823	126447	55398	162237	104490	43504	47605	92067	169343	171823
1995	336227	298467	306570	228582	176251	136762	59917	174375	112715	45510	51489	98380	188879	196914
2005	358043	316007	324520	243955	189907	145515	63752	183809	119489	47273	54786	103547	203618	215101
2015	385907	339428	348232	258345	205818	156724	68662	196994	128522	50106	59004	111132	220880	234708
2025	414257	363652	372936	275863	221740	168257	73715	210649	137774	52820	63344	118521	238127	253788
			ACTIVITY DAYS											
1974	10434	2295	6226	12053	1427	1729	826	2722	1064	857	1139	712	1973	3172
1985	11797	2472	6673	11555	1699	1851	881	2913	1134	1029	1155	704	2261	4042
1995	13118	2651	7046	12532	1936	2002	953	3150	1225	1199	1215	737	2524	4740
2005	14097	2773	7434	13009	2108	2130	1014	3352	1301	1303	1289	779	2717	5256
2015	15266	2963	7959	13734	2297	2294	1092	3610	1401	1413	1389	835	2947	5769
2025	16433	3164	8506	14374	2481	2463	1173	3876	1503	1510	1483	886	3176	6259
NJ OCEAN			PARTICIPANTS											
1974	171162	167847	170930	117879	83584	77355	34344	95933	62844	25380	29006	51167	83218	74308
1985	189882	178834	182542	126718	95936	82650	36695	101800	66741	25435	30991	53920	99085	93330
1995	192241	176141	179423	128454	99619	81746	36292	99944	65810	24194	30651	53247	104788	102648
2005	205021	184420	187916	132711	108611	85954	38162	104185	68942	24729	32230	55765	115498	116809
2015	219770	195421	198960	141076	117988	91317	40543	110149	73130	25788	34241	59215	126190	130108
2025	231932	204646	208221	147824	125719	95853	42557	115098	76651	26592	35942	62021	134933	140911
			ACTIVITY DAYS											
1974	5872	1432	4019	7123	772	1134	546	1811	683	471	687	421	1098	1520
1985	6880	1532	4290	6814	943	1211	584	1939	726	534	695	414	1314	1996
1995	7231	1500	4155	6700	1021	1198	577	1914	717	573	660	395	1392	2260
2005	7924	1553	4335	6838	1151	1260	607	2013	753	642	697	411	1536	2676
2015	8631	1638	4581	7100	1275	1330	645	2138	799	715	738	432	1679	3041
2025	9207	1707	4789	7261	1377	1405	677	2245	838	772	773	450	1795	3340
NJ PASSAIC			PARTICIPANTS											
1974	321153	304772	313759	222340	156168	131818	57435	173510	108726	47747	48847	97522	160879	148076
1985	343470	317374	327253	232363	171862	137580	59946	180094	112935	47338	50983	100420	181333	174520
1995	364896	331159	341128	243243	186619	144162	62813	187231	117809	47515	53422	103673	199350	198090
2005	387334	347052	357483	255908	201105	151406	65970	195768	123561	49214	56106	109181	216243	219852
2015	409849	363760	374306	268636	215572	159139	69339	204702	129671	50826	58972	114528	232465	240820
2025	431162	380207	390945	280672	228832	166769	72604	213466	135629	52285	61799	119401	247391	259162
			ACTIVITY DAYS											
1974	11330	2641	7357	13029	1511	1939	911	3151	1172	895	1250	791	2068	3146
1985	12627	2758	7679	12452	1750	2023	951	3289	1218	996	1258	775	2349	3859
1995	13000	2865	7888	12816	1966	2120	996	3446	1273	1119	1267	775	2502	4494
2005	14916	2982	8238	13253	2169	2227	1046	3620	1337	1237	1335	815	2815	5119
2015	15993	3108	8602	13651	2365	2340	1100	3804	1405	1366	1402	850	3025	5729
2025	16980	3235	8973	13962	2538	2453	1153	3987	1470	1469	1460	880	3220	6235

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TABLE 4.A.7a—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ PHILADELPHIA SMSA-NJ — PARTICIPANTS														
1974	624254	587649	604329	445981	302320	261960	110276	343457	218417	100340	98041	199913	310565	286726
1985	732106	670023	691887	507425	366822	299075	125896	390184	247788	107182	111928	222497	387158	377303
1995	793458	712980	734708	544449	406368	319330	134422	414243	263954	111130	119509	236419	433850	437754
2005	853244	757669	780492	577418	445221	341138	143602	438158	280832	115741	127670	250367	477535	493826
2015	913245	805640	829341	614219	480961	363672	153088	464917	299030	121528	136104	266407	516677	541081
2025	974012	855301	879545	651356	516397	386995	162906	492590	317741	127343	144832	282361	555724	586506
ACTIVITY DAYS														
1974	22053	5181	14276	27894	2923	3841	1750	6017	2360	1830	2629	1661	4003	6189
1985	27104	5947	16321	28326	3775	4385	1998	6869	2679	2254	2824	1740	5039	8945
1995	30228	6301	17031	30434	4336	4682	2133	7334	2858	2620	2941	1806	5666	10204
2005	33119	6613	18011	31813	4861	5002	2279	7835	3048	2940	3124	1914	6238	11817
2015	35759	6995	19081	33299	5311	5333	2429	8353	3249	3228	3333	2030	6745	13130
2025	38387	7396	20214	34712	5746	5675	2585	8888	3455	3483	3537	2142	7256	14340
NJ SALEM — PARTICIPANTS														
1974	43371	41402	42621	30619	20950	18780	7515	24109	15514	6759	7036	13585	21202	19105
1985	45911	42485	43893	31492	22932	19292	7720	24663	15849	6526	7228	13695	23952	22831
1995	49344	44719	46109	33427	25242	20389	8159	25884	16699	6656	7639	14380	26755	26492
2005	52504	46884	48338	35046	27431	21482	8597	27014	17526	6848	8049	15061	29274	29861
2015	56258	49775	51273	37249	29764	22870	9152	28613	18629	7161	8569	15985	31848	33081
2025	59803	52571	54118	39375	31897	24201	9685	30171	19692	7471	9067	16882	34220	35935
ACTIVITY DAYS														
1974	1505	360	997	1899	196	275	119	421	168	120	180	112	260	397
1985	1676	372	1027	1748	230	283	122	432	172	132	175	106	307	499
1995	1860	389	1060	1844	263	299	129	457	181	152	180	109	344	599
2005	2025	403	1107	1903	294	315	136	481	191	171	189	114	377	698
2015	2197	425	1172	1983	325	335	145	512	203	191	200	120	410	790
2025	2356	448	1234	2062	352	355	153	542	215	207	212	126	441	868
NJ SOMERSET — PARTICIPANTS														
1974	146793	134653	138073	103270	73151	61333	26650	78926	50906	22171	23070	45778	76816	73736
1985	156024	140483	144603	107037	80122	64015	27815	82116	52867	21745	24079	46422	85306	86112
1995	166994	148562	152655	113575	87311	67940	29521	86643	55967	224.4	25555	48766	93476	97020
2005	176497	155947	160190	118513	93509	71690	31151	90502	58814	23014	26966	50849	100302	105653
2015	186856	164492	168835	124774	99586	75802	32937	95262	62109	23936	28513	53544	106843	113343
2025	196800	173766	178266	131158	104599	80214	34854	100483	65654	25002	30172	56323	112097	118101
ACTIVITY DAYS														
1974	5406	1188	3207	6264	738	898	424	1411	553	440	589	367	1018	1629
1985	5946	1249	3353	5855	852	937	442	1472	574	511	581	353	1135	2008
1995	6494	1315	3483	6243	955	995	469	1563	608	586	601	365	1244	2319
2005	6943	1363	3642	6406	1036	1050	495	1649	641	632	631	381	1334	2566
2015	7303	1431	3829	6632	1109	1110	524	1744	677	677	667	401	1420	2775
2025	7743	1507	4038	6889	1157	1174	554	1845	717	696	705	421	1490	2868
NJ SUSSEX — PARTICIPANTS														
1974	29531	27933	28555	20884	14411	12775	5704	16314	10566	4599	4807	9237	14704	13496
1985	65308	60053	61606	44925	32926	27497	12278	34963	22620	9303	10347	19494	34600	33502
1995	68164	65257	66905	47216	33105	30005	13398	37880	24604	9791	11291	20254	33398	29963
2005	79070	70516	72187	53032	41589	32566	14542	40763	26616	10386	12254	22740	44472	45899
2015	86086	76202	77909	57381	45768	35266	15756	43959	28811	11101	13278	24635	49000	51376
2025	93541	82416	84230	61853	50118	38268	17088	47423	31175	11759	14400	26473	53754	56849
ACTIVITY DAYS														
1974	1042	246	670	1292	138	187	91	297	115	85	122	76	195	286
1985	2418	532	1445	2493	335	403	195	640	246	196	247	151	464	745
1995	2356	575	1539	2720	307	439	213	698	267	188	262	159	441	611
2005	3077	614	1657	2884	451	477	231	758	290	269	284	171	597	1088
2015	3383	660	1785	3070	504	517	251	821	314	304	309	186	657	1241
2025	3703	711	1946	3225	556	560	272	891	340	334	332	198	721	1384
NJ UNION — PARTICIPANTS														
1974	385629	356845	367072	263911	192429	160173	67394	205015	131494	55067	59817	115579	201000	190751
1985	394627	357476	368884	263687	202437	160595	67571	204815	131189	52065	59974	113204	215215	213539
1995	409265	365389	376331	270295	214054	164863	69367	208640	134207	51251	61568	114644	229427	234224
2005	420171	371764	383062	273609	223067	168557	70922	211251	136628	50879	62948	115850	239932	249427
2015	429398	377963	389164	277873	229748	171751	72266	214319	139031	50938	64161	117560	247361	259825
2025	437573	383652	394812	281877	235411	174670	73494	217210	141218	51089	65231	119080	253802	260353
ACTIVITY DAYS														
1974	14055	3076	8554	15169	1917	2350	1069	3698	1426	1096	1490	920	2594	4152
1985	14904	3102	8597	13657	2119	2356	1072	3708	1423	1198	1416	854	2796	4861
1995	15823	3152	8612	13932	2307	2419	1100	3806	1458	1323	1407	842	2988	5400
2005	16481	3167	8730	13818	2445	2473	1125	3892	1488	1395	1427	852	3125	5930
2015	16960	3205	8850	13750	2542	2520	1146	3965	1516	1457	1452	861	3220	6251
2025	17378	3243	8960	13777	2621	2563	1166	4033	1541	1504	1470	868	3304	6497
NJ WARREN — PARTICIPANTS														
1974	52612	50481	51538	36725	25538	22714	10365	28995	18678	7998	8498	16109	25878	23308
1985	59514	55337	56673	40354	29875	24945	11383	31666	20391	8233	9333	17441	31279	29775
1995	67119	61135	62473	44938	34510	27686	12634	34866	22553	8817	10359	19228	36679	36293
2005	75101	67379	68860	49624	39432	30626	13976	38286	24877	9555	11458	21218	42194	43050
2015	84115	74754	76317	55063	44775	34090	15556	42355	27635	10395	12754	23493	48028	49972
2025	93161	82278	83957	60545	50029	37610	17163	46518	30433	11254	14072	25771	55787	56682
ACTIVITY DAYS														
1974	1830	437	1210	2231	239	333	165	542	203	144	214	134	343	482
1985	2140	481	1330	2189	299	366	181	595	221	160	222	135	418	646
1995	2541	528	1442	2430	360	406	201	660	245	203	240	145	492	816
2005	2909	576	1583	2638	424	449	222	730	271	242	265	160	566	1004
2015	3301	635	1749	2859	490	500	248	813	301	284	293	176	643	1191
2025	3689	697	1921	3074	553	552	273	897	332	321	321	192	720	1368

IDE ASSOCIATES, INC.

TABLE 4.A.7a--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM-MING	PICNIC-KING	SS. PLEAS DRIVE	BICYC-LING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
NY TOTAL			PARTICIPANTS											
1974	9178403	8768660	9041891	6378580	4412104	3550449	1594766	4901934	2951162	1383652	1294684	2806089	4574355	4240458
1985	9615156	8936440	9246283	6516367	4758749	3625349	1627931	4986698	2997507	1335018	1322470	2812446	5049371	4892187
1995	10113460	9207137	9505687	6772629	5112090	3754434	1685288	5121856	3094291	1327561	1370062	2888870	5490646	5479703
2005	10529406	9452977	9753741	6959265	5417878	3879409	1740710	5236493	3183986	1339067	1416190	2967252	5858774	5974690
2015	10922899	9712393	10009496	7170975	5683880	4001687	1794807	5370149	3279497	1358301	1461345	3050314	6172194	6386620
2025	11264986	9949011	10247065	7347402	5911738	4113089	1844196	5491601	3364704	1371025	1502490	3128084	6437870	6728659
			ACTIVITY DAYS											
1974	322788	76072	213175	374089	43501	52468	25260	89341	31511	26471	35550	22852	58228	91990
1985	351999	78055	217494	343410	49199	53569	25787	91140	32013	28816	34408	21653	64678	109094
1995	380882	80030	219788	354695	54499	55470	26697	94292	33118	31852	34469	21560	70545	129638
2005	404467	81215	224879	358697	59001	57310	27576	97330	34159	34188	35442	22116	75398	140013
2015	424928	83018	230178	363246	62803	59111	28435	100302	35227	36407	36538	22657	79521	151897
2025	442203	84749	235289	364632	65974	60751	29217	103005	36176	38204	37317	22990	83007	161582
NY ALBANY SMSA			PARTICIPANTS											
1974	509304	485324	496234	355482	246922	209830	97710	275713	173393	77962	77809	157471	253650	231991
1985	544205	504346	517638	369168	272032	218340	101673	285513	179323	76121	80965	160191	287054	275458
1995	572424	520099	532341	384294	292487	226127	105299	293545	185208	76240	83652	165240	312727	310372
2005	595268	533352	546074	393879	310215	232883	108445	299714	189990	76546	86358	168952	333914	340616
2015	612615	543628	555901	402437	323409	238036	110844	304780	193936	77033	88269	172582	349140	362856
2025	623102	549428	561428	406106	332072	241320	112373	307188	196130	76540	89486	173760	359380	377683
			ACTIVITY DAYS											
1974	17900	4200	11740	21450	2372	3085	1554	5161	1869	1429	2055	1303	3341	4915
1985	19991	4391	12242	19899	2763	3211	1617	5371	1933	1577	2017	1250	3808	6083
1995	21671	4501	12364	20774	3080	3325	1675	5562	2000	1766	2036	1257	4160	7043
2005	23026	4565	12626	20873	3355	3424	1725	5729	2057	1925	2080	1282	4444	7965
2015	24015	4627	12823	20968	3559	3500	1763	5855	2102	2067	2127	1303	4643	8665
2025	24658	4653	12934	20740	3694	3548	1787	5936	2127	2146	2140	1303	4779	9118
NY BROOME & TIOGA			PARTICIPANTS											
1974	180329	173362	177002	127424	87108	76431	35408	99523	63263	28269	28500	56568	88578	80561
1985	185524	173024	177334	127265	92544	76385	35387	98978	62841	26518	28482	55332	96936	92796
1995	191444	174352	178835	129973	97610	77425	35869	99810	63564	26053	28871	55934	103709	102848
2005	195444	175971	179976	130859	101610	78265	36259	100023	64032	25746	29184	56300	108706	110770
2015	199250	177777	181659	132571	104765	79230	36706	100872	64768	25733	29544	57054	112428	116508
2025	201154	178345	182162	132935	106659	79652	36901	100993	65007	25428	29701	57101	114768	120219
			ACTIVITY DAYS											
1974	6285	1510	4166	7914	827	1122	563	1851	684	513	745	471	1178	1699
1985	6774	1516	4170	7082	933	1121	563	1850	679	545	702	434	1297	2049
1995	7215	1527	4129	7217	1023	1137	571	1875	688	600	693	427	1390	2333
2005	7525	1519	4141	7130	1093	1149	577	1895	695	641	699	430	1457	2592
2015	7764	1527	4169	7106	1145	1163	584	1919	703	678	.709	434	1506	2779
2025	7908	1527	4173	6966	1178	1169	587	1929	706	698	709	431	1537	2898
NY CHENANGO			PARTICIPANTS											
1974	31398	30935	31511	22332	15148	14579	6368	18091	11970	5026	5510	9900	14893	13104
1985	33090	31397	32097	22747	16497	14832	6478	18284	12097	4768	5606	9855	16842	15694
1995	34256	31638	32270	23277	17489	14995	6549	18386	12206	4690	5667	10000	18206	17633
2005	35823	32494	33146	23916	18686	15466	6756	18806	12549	4728	5846	10299	19666	19659
2015	36476	32680	33296	24215	19300	15601	6814	18871	12640	4693	5896	10409	20449	20877
2025	36920	32801	33398	24311	19747	15701	6857	18897	12698	4633	5934	10431	21010	21750
			ACTIVITY DAYS											
1974	1063	268	737	1443	138	213	101	332	130	89	136	84	198	271
1985	1181	273	750	1308	160	217	103	338	132	94	130	78	225	335
1995	1269	274	743	1330	176	219	104	342	133	103	128	77	244	389
2005	1363	278	760	1341	195	226	108	352	137	113	132	79	263	449
2015	1412	278	762	1326	206	228	108	355	138	119	134	79	274	488
2025	1446	278	764	1300	213	230	109	356	139	124	134	79	282	516
NY COLUMBIA			PARTICIPANTS											
1974	36772	36432	37120	25605	17747	16425	7400	20747	13419	5615	6134	11227	17543	15560
1985	38411	36489	37285	25846	19161	16499	7442	20686	13387	5257	6161	11088	19755	18452
1995	41182	38034	38745	27367	21089	17244	7778	21493	13960	5331	6440	11634	22163	21541
2005	43651	39402	40261	28577	22874	17982	8111	22242	14512	5440	6715	12142	24322	24479
2015	45940	41021	41774	29864	24415	18730	8448	23064	15101	5595	6994	12697	26125	26847
2025	47926	42426	43166	30914	25744	19427	8763	23796	15632	5698	7255	13119	27658	28814
			ACTIVITY DAYS											
1974	1245	311	871	1502	163	241	118	391	146	102	152	94	231	320
1985	1377	313	875	1412	187	242	118	395	145	106	143	87	262	393
1995	1535	324	895	1482	215	253	124	411	152	121	146	88	296	473
2005	1675	333	927	1513	242	264	129	429	158	136	152	91	323	560
2015	1793	344	960	1555	264	275	134	446	165	149	159	95	347	628
2025	1893	355	992	1574	282	285	139	463	170	160	164	97	368	684
NY DELAWARE			PARTICIPANTS											
1974	30276	30422	30934	21416	14455	13788	6303	17382	11247	4826	5124	9499	14133	12394
1985	32189	31189	31821	21976	15832	14090	6483	17731	11400	4604	5270	9511	16043	14675
1995	34476	32466	33045	23269	17331	14724	6770	18617	11965	4678	5503	9988	17937	16977
2005	36447	33666	34271	24260	18674	15325	7047	19026	12417	4775	5720	10423	19587	19035
2015	38331	34876	35457	25308	19954	15918	7319	19670	12884	4898	5950	10885	21113	21037
2025	40151	36112	36681	26287	21179	16526	7599	20320	13351	4995	6177	11288	22566	22917
			ACTIVITY DAYS											
1974	1010	260	725	1379	131	201	100	329	122	85	130	82	189	256
1985	1126	268	746	1252	151	207	103	338	125	89	125	76	214	300
1995	1251	278	763	1315	171	216	108	353	130	98	128	78	240	364
2005	1358	285	788	1345	190	225	112	368	135	107	133	81	262	421
2015	1458	293	815	1375	209	234	116	382	140	117	139	84	283	479
2025	1552	303	842	1395	226	242	121	396	146	127	143	86	302	530

IBE ASSOCIATES, INC.

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AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY DUTCHESS			PARTICIPANTS											
1974	159381	151822	155835	112316	77054	68013	29686	88047	56270	24719	25692	49675	78550	71282
1985	172504	159456	166605	118494	86036	71675	31076	92450	59009	24667	26823	51664	90112	86077
1995	188366	170766	175413	127867	96402	76829	33308	98506	63102	25505	28751	54027	102456	102170
2005	203266	182010	186991	136029	105913	82315	35686	104510	67326	26631	30004	58370	113270	115620
2015	217369	192853	197807	144293	114753	87500	37934	110444	71462	27773	32745	61800	123152	128002
2025	232025	204690	209965	152995	123511	93068	40348	116995	75868	29034	34820	65466	132753	139500
			ACTIVITY DAYS											
1974	9559	1332	3676	6783	730	997	468	1503	609	449	652	407	1022	1490
1985	6301	1612	3886	6441	865	1051	496	1669	638	504	654	398	1183	1896
1995	7123	1502	4066	6912	1016	1127	529	1789	684	599	681	412	1350	2338
2005	7837	1581	4315	7232	1140	1207	567	1916	731	669	725	439	1494	2712
2015	8495	1665	4555	7512	1257	1283	603	2037	777	742	770	462	1626	3062
2025	9139	1761	4824	7810	1367	1365	641	2167	826	811	814	486	1749	3376
NY GREENE			PARTICIPANTS											
1974	24316	24308	24740	16800	11756	11036	4992	13792	8975	3649	4124	7334	11538	10170
1985	26075	24977	25495	17417	13020	11380	5142	14116	9187	3519	4247	7454	13321	12343
1995	28386	26383	26866	18736	14533	12053	5453	14871	9718	3613	4504	7937	15192	14641
2005	30552	27815	28313	19878	15995	12750	5768	15622	10251	3747	4764	8417	16929	16891
2015	31898	28630	29125	20594	16953	13158	5952	16066	10566	3814	4916	8726	18087	18459
2025	32997	29331	29810	21154	17732	13513	6113	16406	10835	3857	5049	8969	19005	19687
			ACTIVITY DAYS											
1974	818	206	580	1021	107	162	79	263	97	66	100	61	153	207
1985	928	213	594	939	126	167	82	271	100	71	97	58	177	260
1995	1051	224	621	997	147	177	87	287	106	81	100	60	202	318
2005	1164	233	652	1036	167	187	92	304	112	92	106	63	225	382
2015	1240	239	670	1052	182	193	95	316	115	101	110	65	241	428
2025	1299	244	685	1058	193	198	97	322	118	108	112	66	253	463
NY NASSAU & SUFFOLK			PARTICIPANTS											
1974	1875942	1722687	1763337	1327990	936222	784603	339235	1008008	651269	286720	294924	589868	981678	944941
1985	1981451	1787156	1837227	1359728	1017526	814937	352350	1042210	672304	277871	306326	591631	1081407	1089239
1995	2110485	1880503	1929292	1438603	1101753	859417	371582	1096930	707984	286069	323046	620392	1177910	1218545
2005	2229959	1972469	2023308	1503049	1178788	905766	391622	1143570	743538	295281	340467	648706	1263367	1325829
2015	2346561	2066880	2117636	1575291	1247671	951251	411288	1196259	780347	306824	357565	681204	1337965	1414516
2025	2452135	2153848	2206151	1636527	1309797	993108	429472	1244174	813547	314565	373374	706549	1406049	1493126
			ACTIVITY DAYS											
1974	69131	15099	40988	82013	9460	11489	5393	18037	7069	5688	7645	4790	12978	20985
1985	75393	15779	42590	75905	10787	11934	5601	18735	7301	6469	7451	4551	14343	25333
1995	81896	16564	46048	80549	11998	12585	5907	19757	7696	7366	7695	4682	15635	29032
2005	87534	17161	46057	83274	13007	13264	6225	20823	8100	7937	8102	4925	16764	32086
2015	92578	17898	48144	86178	13856	13930	6538	21869	8508	8472	8551	5170	17739	34536
2025	97108	18591	50080	87665	14606	14546	6827	22835	8877	8802	8876	5330	18639	36403
NY NEW YORK CITY			PARTICIPANTS											
1974	5107345	4976637	5159830	3528424	2403671	1851718	846971	2706926	1545083	765169	659087	1542234	2488256	2273928
1985	5314635	5012622	5213474	3580933	2570456	1865378	853219	2720634	1549206	734756	663949	1530856	2733605	2598186
1995	5538899	5097887	5291143	3673362	2740541	1905484	871564	2756056	1576057	715916	678225	1559648	2958595	2898444
2005	5710380	5167039	5358249	3740471	2881802	1941399	887991	2779694	1598575	712760	691008	1584848	3139860	3151695
2015	5868308	5244807	5432940	3811667	3002472	1976493	904043	2813727	1624160	711799	703499	1613620	3292217	3364183
2025	5999878	5315611	5502252	3864680	3101350	2007994	918451	2845230	1646703	710971	714711	1635003	3414039	3533083
			ACTIVITY DAYS											
1974	175786	43004	122400	199926	23570	27557	13375	49502	16282	14431	19108	12538	30753	48767
1985	190627	43601	123837	182252	26366	27760	13673	49866	16322	15307	18361	11832	34065	57465
1995	205102	44082	123026	184933	29006	28357	13763	50940	16647	16559	18031	11550	37004	65175
2005	216461	44175	124316	184612	31258	28892	14023	51900	16920	17641	18271	11675	39385	72586
2015	226173	44593	125661	184103	33177	29414	14276	52818	17212	18680	18531	11768	41395	78836
2025	233928	45029	127107	182971	34709	29883	14504	53680	17465	19557	18710	11811	42978	83817
NY ORANGE			PARTICIPANTS											
1974	159985	153796	157490	113030	77073	67749	30063	88613	56071	25172	25240	50159	78268	70892
1985	172397	160351	164781	118231	85861	70726	31386	91874	58202	24701	26349	51625	89960	85946
1995	187288	170352	174716	126917	95487	75400	33459	97349	61883	25441	28091	54592	101535	100631
2005	201414	180411	184993	134384	104909	80275	35622	102592	65605	26361	29907	57736	112384	114661
2015	214897	190612	195210	142355	113323	85056	37743	108145	69417	27523	31688	61166	121865	126500
2025	227392	200419	205165	149621	120931	89623	39770	113482	73031	28528	33390	64212	130405	136829
			ACTIVITY DAYS											
1974	5556	1340	3721	6998	730	995	478	1612	605	455	661	417	1020	1493
1985	6288	1406	3892	6536	865	1038	499	1683	628	508	653	402	1182	1895
1995	7056	1486	4049	6993	1001	1107	532	1796	669	588	676	415	1338	2285
2005	7769	1556	4274	7248	1131	1179	566	1910	711	663	716	430	1481	2687
2015	8402	1633	4499	7549	1242	1249	600	2024	753	732	759	441	1606	3021
2025	8970	1711	4725	7759	1440	1316	632	2132	793	790	796	481	1719	3383
NY OTSEGO			PARTICIPANTS											
1974	38445	38169	38874	27361	18310	17080	7870	21906	14097	6333	6383	12328	18072	19918
1985	41161	39196	40063	28247	20290	17593	8106	22385	14409	6009	6575	12433	20030	19293
1995	43935	40591	41368	29687	22254	18316	8439	23093	14946	6094	6845	12917	23338	22405
2005	45776	41449	42247	30488	23712	18771	8649	23494	15273	6113	7015	13260	25179	25100
2015	47358	42295	43053	31290	24921	19210	8851	23918	15608	6163	7179	13613	26681	27211
2025	48625	43045	43792	31904	25875	19592	9027	24297	15894	6191	7321	13854	27820	28821
			ACTIVITY DAYS											
1974	1249	329	933	1727	168	251	125	418	153	109	170	107	240	336
1985	1459	339	962	1579	197	258	129	423	156	116	165	101	278	417
1995	1622	349	975	1646	225	269	134	440	162	130	166	102	312	490
2005	1740	352	990	1656	249	275	138	451	166	142	170	104	337	576
2015	1837	357	1007	1671	268	282	141	462	170	153	174	106	357	639
2025	1910	362	1022	1672	282	287	144	471	173	162	176	107	373	687

IDE ASSOCIATES, INC.

TABLE 4.A.7a—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—LOW GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM-MING	PICNIC-KING	SS. PLEAS DRIVE	BICYC-LING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SHOWN	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
NY PUTNAM			PARTICIPANTS											
1974	45118	42240	43145	32176	22180	19271	8594	24780	15999	7088	7254	14262	22946	21910
1985	51212	46854	48038	35464	26023	21412	9548	27381	17668	7342	8060	15372	27455	27176
1995	58187	52440	53677	39863	30174	24042	10721	30571	19788	7969	9090	17005	32100	32829
2005	64912	57919	59261	43966	34187	26678	11897	33629	21889	8692	10042	18872	36507	38082
2015	73234	64964	66394	49327	38877	29999	13377	37644	24589	9647	11292	21197	41953	43803
2025	82098	72535	74095	54914	43841	33583	14975	41933	27474	10503	12641	23565	46932	49761
			ACTIVITY DAYS											
1974	1626	374	1007	2040	217	282	137	448	173	134	185	116	307	462
1985	1922	417	1119	2012	270	313	152	498	192	164	193	118	369	619
1995	2237	465	1229	2251	324	352	171	559	215	200	211	128	432	770
2005	2534	508	1354	2456	374	391	189	620	238	231	234	142	491	914
2015	2879	567	1515	2714	430	439	213	697	268	266	265	160	558	1065
2025	3244	630	1689	2952	487	492	238	780	300	300	294	176	630	1216
NY ROCKLAND & WESTCHESTER			PARTICIPANTS											
1974	811012	744177	764097	559573	407193	329167	142655	427679	271753	117631	122685	245908	429302	417211
1985	853433	765479	788661	573022	438388	338737	146803	438792	278320	114075	126252	246643	468600	470733
1995	898054	798319	821206	598594	470696	354579	153668	456238	290407	114657	132156	254503	506164	524983
2005	938332	828007	851676	617393	498088	369727	160233	470850	301498	116296	137802	262245	538767	564258
2015	981749	862277	886036	643549	524031	385760	167182	489576	314406	120051	143778	273896	565640	598771
2025	1019326	892860	917375	665077	546090	399965	173338	506219	329637	122504	149072	282656	590114	627137
			ACTIVITY DAYS											
1974	30041	6468	17808	32754	4171	4833	2265	7740	2940	2464	3130	1954	5603	9348
1985	32498	6704	18364	30459	4695	4973	2330	7965	3011	2773	3052	1860	6137	11095
1995	34983	6960	18780	31382	5162	5206	2439	8337	3147	3083	3091	1870	6636	12495
2005	36963	7124	19406	31864	5527	5428	2544	8693	3275	3277	3204	1934	7034	13621
2015	38897	7387	20144	32814	5895	5664	2654	9070	3418	3467	3359	2018	7412	14563
2025	40525	7631	20809	33265	6129	5872	2752	9404	3543	3611	3466	2070	7733	15307
NY SCHOHARIE			PARTICIPANTS											
1974	19394	19530	19814	13925	9259	8906	4041	11250	7334	3220	3339	6269	9001	7918
1985	22031	21297	21680	15243	10870	9744	4422	12207	7963	3279	3653	6697	11010	10154
1995	24916	23369	23743	16986	12599	10733	4871	13356	8744	3492	4024	7388	13050	12499
2005	27019	24813	25213	18163	13965	11439	5191	14128	9295	3647	4289	7889	14663	14517
2015	27365	25591	25970	18437	13932	11828	5367	14542	9601	3723	4435	8048	14452	13880
2025	29388	26404	26673	19395	15616	12195	5534	14908	9876	3763	4573	8420	16635	17126
			ACTIVITY DAYS											
1974	647	167	468	921	84	131	64	211	80	56	87	55	121	164
1985	775	183	512	896	104	143	70	231	86	62	89	55	148	216
1995	912	200	532	986	126	157	78	254	95	73	96	58	175	273
2005	1018	210	583	1031	144	168	83	271	101	83	102	62	197	329
2015	1006	215	600	1052	139	173	85	280	105	78	106	64	194	304
2025	1146	220	615	1057	168	179	88	289	108	97	108	65	223	404
NY SULLIVAN			PARTICIPANTS											
1974	37932	38061	38925	26516	18141	16934	7504	21639	13862	5856	6305	11695	17847	15723
1985	40126	38925	39929	27212	19711	17349	7688	22050	14118	5625	6460	11700	20010	18356
1995	43131	40712	41676	28786	21687	18233	8080	22974	14782	5660	6789	12236	22452	21308
2005	45941	42222	43235	29915	23325	18993	8417	23719	15334	5722	7072	12671	24446	23781
2015	48187	44077	45094	31414	25006	19874	8807	24711	16031	5912	7400	13341	26419	26216
2025	50800	45949	46975	32809	26694	20779	9208	25692	16723	6047	7737	13899	28404	28663
			ACTIVITY DAYS											
1974	1271	326	914	1622	166	249	119	403	150	104	150	98	234	322
1985	1403	335	938	1495	189	255	122	413	153	110	153	93	262	387
1995	1562	348	962	1503	215	268	128	434	160	122	155	93	295	459
2005	1690	357	992	1509	238	279	134	452	167	131	160	96	321	524
2015	1820	370	1033	1612	260	292	140	473	175	143	168	100	347	591
2025	1950	384	1075	1638	283	305	146	495	182	155	174	103	374	657
NY ULSTER			PARTICIPANTS											
1974	103454	100758	102995	73210	49867	44995	20158	58040	37157	16397	16814	32532	50083	45267
1985	109712	103484	106157	75354	54486	46275	20732	59407	37993	15846	17292	32794	56422	53409
1995	118051	108776	111351	80048	59958	48833	21878	62261	39975	16113	18248	34449	63104	61797
2005	125646	113458	116507	83958	65135	51373	23016	64874	41894	16562	19197	36122	69199	69677
2015	133361	119425	122064	88363	70106	54043	24212	67880	44001	17120	20195	37996	74908	76936
2025	141069	125307	127997	92773	74904	56843	25467	71071	46200	17688	21241	39812	80340	83598
			ACTIVITY DAYS											
1974	3561	877	2440	4520	469	660	321	1067	402	297	435	272	661	957
1985	3952	906	2515	4153	541	679	330	1098	411	320	423	259	748	1171
1995	4393	947	2588	4306	617	716	348	1158	433	362	433	263	838	1387
2005	4790	979	2699	4519	690	754	366	1218	455	401	454	276	919	1611
2015	5168	1022	2820	4660	758	793	385	1282	478	442	477	288	995	1817
2025	5528	1068	2953	4789	820	834	405	1348	503	479	499	299	1067	2008
CT TOTAL			PARTICIPANTS											
1974	1191230	1111564	1140420	828572	588876	496699	216700	641148	409954	178520	185616	366133	611639	576815
1985	1255921	1145446	1179033	851372	639147	512411	223650	658559	420619	173406	191402	368743	677326	667959
1995	1330225	1194573	1227087	891255	690667	536649	234301	684473	438986	174581	200532	381453	738718	758623
2005	1393036	1238284	1272249	920670	734990	558840	244049	706229	455322	177103	208018	393492	788368	818411
2015	1450631	1281384	1314992	953567	771967	579630	253178	729319	471794	181241	216500	407810	830189	870961
2025	1498828	1310465	1352041	978299	803093	597670	261185	748422	485565	183143	223586	417276	865079	914130
			ACTIVITY DAYS											
1974	43000	9666	26790	49339	5814	7286	3442	11637	4439	3446	4754	2971	7999	12528
1985	47098	10023	27701	45627	6647	7517	3553	12008	4555	3848	4649	2834	8914	15183
1995	51138	10393	28312	47610	7409	7873	3722	12579	4762	4336	4710	2857	9744	17673
2005	54415	10643	29237	48322	8038	8198	3877	13102	4951	4692	4875	2951	10413	19605
2015	57129	10956	30140	49396	8532	8503	4022	13592	5135	5017	5060	3053	10942	21018
2025	59403	11224	30947	49629	8937	8771	4149	14022	5209	5241	5182	3180	11401	22204

TABLE 4.A.7o—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—LOW GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
CT FAIRFIELD			PARTICIPANTS											
1974	560187	517125	530646	388528	279933	232633	100448	299144	191979	82700	87070	171335	292799	281047
1985	567000	512660	527870	383575	291310	230821	99657	295699	189502	77178	86392	165465	309887	310766
1995	580335	517614	531980	388486	303604	233964	101014	297677	191484	75390	87568	165066	325315	334989
2005	590129	521971	536577	389893	313083	237078	102359	298788	193254	74398	88734	166308	336456	352199
2015	598306	526658	540637	393442	319518	239747	103511	300918	195253	74280	89733	167907	343699	362063
2025	602682	528733	542561	393921	323621	241364	104210	301394	196179	73413	90538	167941	348538	369798
			ACTIVITY DAYS											
1974	20539	4499	12390	23065	2819	3411	1505	5403	2081	1672	2210	1377	3883	6227
1985	21522	4492	12316	20513	3080	3384	1583	5361	2055	1805	2075	1261	4077	7186
1995	22510	4513	12197	20731	3298	3431	1604	5434	2080	1959	2040	1233	4287	7913
2005	23191	4494	12256	20454	3453	3476	1626	5507	2104	2041	2056	1240	4433	8470
2015	23655	4513	12327	20368	3550	3515	1644	5569	2127	2104	2085	1251	4525	8810
2025	23944	4511	12352	20034	3613	3539	1655	5606	2139	2131	2086	1243	4589	9018
CT LITCHFIELD			PARTICIPANTS											
1974	102619	96583	96632	71103	50697	44172	19873	55754	36250	15221	16585	31272	52133	48198
1985	116011	106315	108901	78207	59247	48716	21917	61152	39747	15752	18291	33716	62511	61032
1995	127390	114792	117348	84840	66518	52829	23767	65812	42956	16440	19836	36155	70950	71712
2005	136946	121916	124658	89934	72482	56356	25354	69594	45658	17104	21160	38295	78073	81057
2015	144494	127856	130629	94168	77631	59270	26665	72803	47933	17623	22254	39903	83222	87505
2025	149230	131480	134233	96611	80705	61112	27494	74692	49331	17800	22946	40993	86658	91761
			ACTIVITY DAYS											
1974	3666	836	2311	4250	488	647	316	1037	394	285	410	294	693	1019
1985	4342	925	2551	4195	608	714	349	1144	432	342	428	299	838	1361
1995	4903	993	2703	4531	708	774	378	1241	468	405	450	270	953	1650
2005	5372	1042	2859	4723	795	826	404	1323	498	460	477	286	1048	1924
2015	5715	1087	2968	4844	856	868	424	1392	524	500	500	298	1115	2108
2025	5938	1113	3067	4861	896	895	438	1435	539	522	512	303	1161	2226
CT NEW HAVEN			PARTICIPANTS											
1974	528424	497856	511142	368961	258246	219894	96387	286250	181725	80599	81961	163526	266707	246778
1985	572902	526471	542262	389590	288582	232874	102076	301708	191370	80474	86799	169362	304926	296161
1995	622500	562167	577751	417929	320545	249856	109520	320984	204546	82751	93128	179432	342493	343752
2005	665961	594397	611014	440843	349025	265406	116336	337847	216410	85601	98924	188929	374839	385195
2015	707831	626870	643526	465457	374818	280613	123002	355598	228608	89338	104593	199840	403264	420613
2025	746416	658052	675247	487767	398767	295394	129481	372336	240055	91922	110182	208382	429887	452571
			ACTIVITY DAYS											
1974	18795	4331	12090	22024	2507	3228	1531	5196	1964	1489	2134	1340	3472	5282
1985	21234	4606	12835	20919	2960	3419	1621	5503	2068	1701	2142	1314	3999	6636
1995	23725	4887	13411	22356	3403	3668	1739	5904	2215	1972	2220	1354	4504	7910
2005	25851	5107	14122	23165	3790	3897	1848	6272	2349	2192	2342	1425	4932	9091
2015	27760	5356	14824	24184	4126	4120	1953	6631	2484	2413	2484	1504	5302	10099
2025	29522	5601	15528	24734	4428	4337	2056	6980	2610	2588	2584	1554	5652	10960
DE TOTAL			PARTICIPANTS											
1974	281038	264664	272548	201324	135701	117280	48548	154707	97964	45517	43832	90443	139219	128396
1985	299548	275108	284509	208624	148996	121992	50498	160301	101308	44428	45594	91779	156860	151635
1995	322808	291307	300564	222361	164020	129729	53701	169234	107400	45627	48485	96805	174822	174576
2005	345306	307746	317435	234657	178811	137751	57021	177980	113595	47363	51483	102095	191666	196305
2015	368110	325448	335318	248534	192800	146044	60454	187834	120308	49521	54583	108164	207005	215589
2025	390875	343844	354406	261269	206565	154698	64037	197923	127044	51025	57817	112985	222245	233838
			ACTIVITY DAYS											
1974	9899	2335	6444	12637	1310	1720	770	2683	1058	828	1190	753	1777	2777
1985	11006	2446	6719	11715	1521	1790	801	2791	1094	910	1167	721	2024	3409
1995	12201	2575	6963	12505	1734	1903	851	2968	1162	1040	1206	742	2266	4024
2005	13312	2687	7329	13012	1937	2021	904	3151	1232	1160	1275	783	2487	4650
2015	14345	2827	7722	13570	2119	2142	958	3341	1306	1285	1355	828	2684	5206
2025	15355	2979	8150	13816	2293	2269	1015	3539	1380	1387	1409	853	2882	5700
DE NEW CASTLE			PARTICIPANTS											
1974	281038	264664	272548	201324	135701	117280	48548	154707	97964	45517	43832	90443	139219	128396
1985	299548	275108	284509	208624	148996	121992	50498	160301	101308	44428	45594	91779	156860	151635
1995	322808	291307	300564	222361	164020	129729	53701	169234	107400	45627	48485	96805	174822	174576
2005	345306	307746	317435	234657	178811	137751	57021	177980	113595	47363	51483	102095	191666	196305
2015	368110	325448	335318	248534	192800	146044	60454	187834	120308	49521	54583	108164	207005	215589
2025	390875	343844	354406	261269	206565	154698	64037	197923	127044	51025	57817	112985	222245	233838
			ACTIVITY DAYS											
1974	9899	2335	6444	12637	1310	1720	770	2683	1058	828	1190	753	1777	2777
1985	11006	2446	6719	11715	1521	1790	801	2791	1094	910	1167	721	2024	3409
1995	12201	2575	6963	12505	1734	1903	851	2968	1162	1040	1206	742	2266	4024
2005	13312	2687	7329	13012	1937	2021	904	3151	1232	1160	1275	783	2487	4650
2015	14345	2827	7722	13570	2119	2142	958	3341	1306	1285	1355	828	2684	5206
2025	15355	2979	8150	13816	2293	2269	1015	3539	1380	1387	1409	853	2882	5700

TABLE 4.A.7b—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--HIGH GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
TOTAL SERVICE AREA			PARTICIPANTS											
1974	20260333	19309539	19876067	14141492	9800730	8150838	3587554	10942144	6757215	3077000	3004086	6230927	10107560	9965420
1985	23026203	21334285	22026163	15651180	11470553	9059937	3988153	12073663	7468048	3213368	3343550	6771263	12112038	11711619
1995	25563706	23216644	23914208	17177277	13015742	9935257	4372688	13115075	8162564	3384090	3670092	7350291	13910067	13076533
2005	27988822	25074366	25816275	18566096	14513673	10817044	4758958	14119875	8852935	3593340	3999366	7963336	15609050	15030000
2015	30281408	26880495	27640473	19960129	15887535	11660521	5128848	15119341	9529751	3807071	4314462	8541343	17142956	17779582
2025	32403465	28581867	29367977	21224979	17148572	12457184	5478248	16056788	10162782	3990918	4612096	9068275	18547566	19435810
			ACTIVITY DAYS											
1974	713642	167669	467785	840931	95587	120071	56878	198306	72583	58074	80263	50992	129503	200971
1985	844718	186519	518233	837087	117628	133410	63244	219744	80285	68597	84299	52299	156576	261039
1995	965229	201985	552371	915413	137863	146258	69352	240405	87957	80494	89512	55177	180562	317609
2005	1078134	215709	594139	974559	157230	159196	75488	261141	95649	91292	96969	59608	203066	373804
2015	1181064	230110	634537	1031062	174682	171571	81365	280966	103107	101946	104463	63792	223268	424052
2025	1275050	243833	673093	1075656	190419	183259	86916	299688	110074	111160	110885	67292	241821	468279
PA TOTAL			PARTICIPANTS											
1974	4887542	4712726	4842909	3423098	2346147	2036651	886972	2685743	1683901	752021	754605	1512690	2381447	2150595
1985	5557078	5206932	5365658	3785672	2746320	2257623	989917	2958361	1855272	782375	836859	1639896	2867411	2707364
1995	6071501	5542216	5718446	4085065	3071105	2426555	1064813	3152259	1987675	809713	900029	1751711	3257213	3183506
2005	6615635	5971377	6137754	4344629	3409019	2621308	1151308	3372951	2139954	854838	972795	1884480	3644998	3653751
2015	7141686	6371824	6540950	4708353	3734742	2809598	1235352	3593377	2290369	901194	1043164	2018688	4012692	4109679
2025	7574464	6701205	6872793	4959907	4004947	2966122	1305407	3773324	2414024	935381	1101705	2123175	4317851	4487883
			ACTIVITY DAYS											
1974	168723	40798	113912	206953	22208	29955	14069	48696	18150	13668	19859	12523	30487	45186
1985	200370	45364	126214	204986	27385	33196	15707	54070	20006	15821	20772	12796	37149	58920
1995	226250	48193	132213	219923	31776	35678	16898	58064	21478	18203	21668	13271	42411	71107
2005	251943	51174	141304	232979	36172	38535	18273	62666	23180	20547	23324	14262	47583	83069
2015	276507	54333	150248	245213	40460	41297	19609	67125	24840	23212	24984	15182	52461	96585
2025	296797	56937	157659	253476	44014	43593	20723	70826	26204	25378	26240	15849	56520	107093
PA BERKS			PARTICIPANTS											
1974	209054	200449	204963	143862	101331	88456	40939	113819	72533	30507	32922	62781	103196	92572
1985	231696	215358	220500	155093	116198	95088	44007	121679	77524	30840	35390	66442	122260	116065
1995	252113	229125	234470	166702	129507	101701	47069	129244	82666	31799	37852	70693	138300	136448
2005	272049	243488	249176	177330	142849	108530	50229	136776	87913	33115	40393	75074	153577	156552
2015	291578	258497	264256	188695	155156	115522	53465	144894	93439	34722	42996	79775	167236	173878
2025	311161	274132	280033	199983	167071	122815	56840	153309	99177	36215	45710	84461	180497	189846
			ACTIVITY DAYS											
1974	7263	1726	4791	8381	950	1299	651	2151	785	554	820	510	1350	1897
1985	8488	1861	5156	8081	1165	1397	700	2312	839	637	834	507	1627	2502
1995	9547	1972	5393	8625	1353	1494	749	2473	896	746	867	524	1846	3047
2005	10551	2073	5711	8975	1540	1594	799	2639	955	860	921	555	2050	3634
2015	11463	2190	6045	9403	1703	1697	851	2809	1016	969	979	587	2230	4138
2025	12344	2313	6398	9726	1855	1804	904	2986	1080	1057	1037	617	2407	4564
PA BRADFORD			PARTICIPANTS											
1974	38360	38534	39274	27672	18106	17373	7926	22312	14365	6381	6511	12311	17641	15358
1985	45188	43611	44603	31476	22038	19713	8993	25141	16189	6768	7388	13709	22376	20465
1995	52388	49097	50107	35905	26228	22299	10173	28202	18244	7368	8358	15462	27231	25904
2005	58797	54006	55104	39744	30079	24618	11231	30913	20094	7980	9227	17140	31637	31107
2015	64215	58138	59245	42982	33407	26597	12134	33184	21664	8485	9968	18542	35440	35700
2025	69513	62308	63474	46235	36565	28542	13021	35520	23231	9011	10697	19936	38995	39947
			ACTIVITY DAYS											
1974	1270	336	923	1823	163	255	126	412	156	111	168	106	236	319
1985	1580	382	1048	1846	210	289	143	468	175	128	179	111	300	432
1995	1907	427	1158	2080	261	327	162	529	198	154	197	121	365	561
2005	2201	465	1269	2247	310	361	179	585	219	181	218	133	424	700
2015	2454	498	1364	2382	353	390	193	632	236	205	235	143	476	824
2025	2693	532	1440	2512	393	418	207	678	253	230	252	152	523	939
PA BUCKS			PARTICIPANTS											
1974	315618	294269	301318	227320	153537	133834	58700	173732	111898	51188	50405	102510	158746	147356
1985	372775	339362	349047	260339	187780	154596	67807	199539	128375	55078	58224	114640	198501	195068
1995	429495	385040	395370	297367	220884	175635	77122	226026	145756	61036	66223	129687	235670	239790
2005	494370	438538	450042	337207	259084	201536	88394	256047	164274	67957	75902	146890	277613	288962
2015	558033	492094	504160	377541	295464	227022	99573	286445	186869	74953	85501	164272	316593	333919
2025	591859	520068	532834	398562	315056	240313	105403	302293	197587	78287	90587	173187	338034	358877
			ACTIVITY DAYS											
1974	11278	2613	7078	14440	1493	1959	934	3082	1213	925	1350	852	2104	3182
1985	13916	3032	8173	14827	1944	2262	1079	3560	1392	1169	1462	900	2640	4449
1995	16453	3431	9110	16925	2371	2573	1227	4049	1583	1457	1625	997	3152	5647
2005	19275	3853	10323	18910	2841	2949	1406	4641	1810	1744	1850	1132	3708	6976
2015	21942	4294	11542	20793	3274	3322	1584	5228	2037	2019	2076	1261	4226	8171
2025	23393	4526	12170	21638	3513	3517	1677	5534	2155	2164	2188	1323	4512	8836
PA CARBON			PARTICIPANTS											
1974	33363	33762	34425	22973	15769	14989	7069	19016	12207	4937	5578	9937	15316	12991
1985	39881	38609	39470	26573	19458	17187	8106	21655	13908	5289	6396	11262	19774	17616
1995	44849	42034	42892	29475	22450	18780	8858	23510	15155	5595	6989	12389	23394	21786
2005	51066	46758	47684	33086	26212	20981	9896	26050	16878	6124	7808	13916	27743	26777
2015	58112	52263	53273	37338	30426	23485	11077	29074	18879	6772	8739	15714	32574	32513
2025	66384	58997	60084	42283	35293	26588	12540	32738	21331	7521	9894	17764	38009	38798
			ACTIVITY DAYS											
1974	1088	287	799	1372	139	220	113	368	132	88	135	83	203	255
1985	1378	330	916	1403	182	252	129	422	151	101	146	88	263	395
1995	1619	357	981	1533	219	276	141	461	165	117	155	93	312	450
2005	1907	393	1088	1685	266	308	158	515	184	140	173	104	370	580
2015	2230	438	1213	1854	320	345	176	576	206	170	194	116	436	732
2025	2594	492	1367	2050	380	391	200	652	233	204	218	129	509	895

IBE ASSOCIATES, INC.

TABLE 4.A.7b—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—HIGH GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA CENTRE			PARTICIPANTS											
1974	70959	69946	71971	52677	33113	30740	13855	41261	25991	13126	11510	24500	32726	29179
1985	80799	76839	79429	58155	38859	33778	15224	45202	28400	13711	12657	26555	39953	37222
1995	89919	83332	85943	63818	44292	36778	16576	48881	30836	14306	13781	28817	46459	44842
2005	98554	89699	92465	68701	49757	39830	17952	52338	33219	15065	14924	30864	52795	52650
2015	106780	95960	98717	73996	54739	42752	19269	55876	35617	16052	16019	33209	58407	59600
2025	113888	101502	104357	78297	59063	45352	20441	58964	37697	16765	16994	35155	63275	65535
			ACTIVITY DAYS											
1974	2364	629	1791	3319	308	451	220	726	279	219	343	219	432	694
1985	2834	696	1980	3273	382	495	242	798	305	244	358	225	532	867
1995	3271	752	2099	3550	452	539	264	869	332	281	379	236	620	1036
2005	3687	799	2242	3740	525	584	286	941	359	321	403	250	704	1251
2015	4070	849	2384	4033	590	627	307	1010	385	363	[illegible]	270	780	1446
2025	[illegible]	894	2516	4208	644	665	325	1071	408	398	456	283	865	1610
PA CHESTER			PARTICIPANTS											
1974	206338	192193	197325	146861	101155	86855	36825	112730	72345	32744	32610	65875	104486	98207
1985	262679	238531	249920	181652	132945	107914	45756	139422	89352	38121	40516	79807	140746	139068
1995	327992	293071	301431	224207	165568	133219	56483	170730	109925	45343	50317	97427	181275	184796
2005	407888	360745	370878	275620	214481	164736	69845	209326	135486	55043	61850	119709	229855	239786
2015	471196	414155	425262	316348	250035	189718	80437	234728	155787	62358	71229	137465	268512	283298
2025	532956	466786	479055	355841	284369	214294	90857	269679	175695	69288	80457	154409	305804	324550
			ACTIVITY DAYS											
1974	7397	1694	4655	9092	994	1272	585	1985	783	620	868	544	1359	2161
1985	9835	2117	5795	10049	1385	1581	727	2466	968	828	1017	623	1847	3196
1995	12606	2585	6975	12395	1825	1952	897	3045	1193	1101	1219	742	2385	4353
2005	15928	3145	8555	15107	2356	2413	1109	3765	1473	1436	1505	916	3021	5798
2015	18964	3589	9787	17070	2776	2779	1277	4336	1696	1692	1734	1049	3530	6930
2025	21106	4031	11007	18868	3175	3139	1443	4897	1914	1929	1948	1171	4020	7900
PA CLINTON			PARTICIPANTS											
1974	25173	25298	25810	18011	11788	11333	5212	14580	9371	4130	4241	8037	11417	9753
1985	27918	26770	27416	19264	13536	12017	5526	15365	9869	4086	4497	8414	13808	12437
1995	30407	28221	28834	20656	15175	12726	5852	16145	10416	4172	4762	8930	15880	14968
2005	32002	29662	30302	21564	16043	13432	6177	16902	10960	4315	5026	9340	16798	15857
2015	34313	31129	31765	22877	17631	14133	6500	17701	11517	4478	5288	9903	18698	18409
2025	37165	33210	33863	24548	19457	15115	6951	18846	12298	4713	5656	10609	20815	21098
			ACTIVITY DAYS											
1974	820	220	608	1145	104	166	83	271	102	71	111	70	151	199
1985	970	234	646	1078	128	176	88	288	107	75	111	68	184	259
1995	1107	245	667	1142	151	187	93	305	113	85	116	69	212	321
2005	1168	254	698	1185	159	197	98	321	119	88	120	73	224	340
2015	1293	266	731	1228	183	207	103	338	125	102	126	76	250	415
2025	1434	282	778	1287	208	222	111	362	134	117	134	81	279	490
PA COLUMBIA			PARTICIPANTS											
1974	37501	37708	34537	26498	17624	16934	7832	21623	13926	5999	6329	11754	17096	14597
1985	43899	42218	43199	29951	21342	18961	8770	24062	15491	6288	7086	13005	21726	19407
1995	47685	44356	45285	32034	23852	20008	9254	25198	16294	6390	7477	13770	24895	23348
2005	50701	46111	47082	33534	26035	20884	9659	26090	16951	6529	7805	14410	27575	26956
2015	53665	48029	48983	35165	28083	21817	10091	27109	17680	6703	8153	15113	30050	30244
2025	56662	50229	51185	36886	30051	22865	10575	28299	18506	6923	8545	15831	32309	33106
			ACTIVITY DAYS											
1974	1222	325	909	1653	156	240	125	408	151	103	163	102	226	294
1985	1522	365	1019	1648	201	278	140	456	168	116	171	104	289	403
1995	1730	381	1050	1737	235	294	147	482	177	131	176	107	332	497
2005	1903	392	1088	1779	268	306	154	503	185	148	183	111	368	601
2015	2065	406	1129	1822	298	320	161	525	193	164	191	115	402	695
2025	2216	423	1177	1880	325	335	168	550	202	181	199	119	433	779
PA HARRISBURG SMSA			PARTICIPANTS											
1974	292804	281200	288336	205545	140906	124803	54882	161807	103131	45233	46568	91047	142462	128081
1985	347124	323476	332820	236080	172128	143794	63233	185488	118112	48984	53654	102892	179666	169252
1995	387363	353415	362841	261179	196393	157757	69374	202030	129178	51794	58864	112303	208356	203111
2005	425379	382465	392620	283025	219829	171485	75410	217725	139936	55092	63986	121715	235175	235486
2015	463667	412356	422915	305725	243454	185423	81540	234153	151044	58424	69187	131226	261355	268153
2025	499148	440623	451532	326842	264904	198647	87355	249661	161539	61569	74121	140078	285208	296910
			ACTIVITY DAYS											
1974	10095	2443	6786	12420	1322	1832	872	2946	1116	818	1209	756	1845	2684
1985	12549	2828	7836	12802	1709	2110	1005	3394	1278	978	1315	803	2351	3670
1995	14467	3072	8387	14056	2025	2315	1102	3724	1400	1147	1401	851	2739	4517
2005	16247	3286	9042	14985	2328	2517	1198	4048	1520	1309	1519	922	3097	5392
2015	18000	3523	9712	15842	2637	2721	1295	4377	1643	1511	1637	987	3440	6316
2025	19596	3749	10358	16619	2909	2915	1388	4689	1758	1677	1746	1046	3795	7101
PA LACKAWANNA			PARTICIPANTS											
1974	155082	154571	157653	106474	73856	67246	32271	86551	54900	22847	24912	46253	73057	63492
1985	160177	158612	162199	110562	81765	69161	33190	88475	56118	22032	25621	47106	84407	77095
1995	174062	161148	164436	114036	88004	70609	33885	89542	57071	21641	26157	48102	92875	88354
2005	181464	164556	167936	117489	93889	72283	34688	91189	58314	21836	26777	49599	100319	99103
2015	187949	167973	171207	[illegible]	98912	73973	35500	92086	59406	22030	27403	51009	106558	108053
2025	193173	171009	174156	123097	102968	75523	36244	94327	60729	22045	27978	51806	111414	114980
			ACTIVITY DAYS											
1974	5167	1315	3682	6282	670	989	514	1681	594	413	619	386	967	1278
1985	5867	1356	3790	5769	787	1017	528	1729	607	434	601	366	1123	1600
1995	6409	1367	3785	5872	885	1039	539	1766	618	474	595	361	1239	1890
2005	6887	1385	3851	5937	981	1063	552	1807	633	528	610	370	1340	2215
2015	7290	1407	3920	5978	1061	1088	565	1850	648	576	629	377	1426	2485
2025	7601	1426	3983	5940	1124	1111	577	1888	660	614	634	379	1492	2694

IDE ASSOCIATES, INC.

TABLE 4.A.7b--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--HIGH GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA LANCASTER			PARTICIPANTS											
1974	227438	214209	223971	161223	108021	96642	44508	126101	80129	36078	36040	71016	109977	98262
1985	276700	259067	265650	190472	136449	114625	52698	148457	94264	40040	42681	83141	142241	133244
1995	309227	283507	290025	210202	156010	125797	57935	161911	103275	42385	46923	90812	165318	160391
2005	340876	308022	315105	228712	175239	137241	63206	175210	112305	45271	51191	98829	187296	186652
2015	372380	332659	339814	247722	194557	148724	68494	188715	121483	48244	55475	106992	208869	213256
2025	402385	356851	364348	265804	212504	159876	73630	202052	130391	51041	59634	114561	228640	237079
			ACTIVITY DAYS											
1974	7817	1913	5292	9990	1016	1419	708	2332	866	638	954	602	1451	2047
1985	9962	2274	6274	10562	1348	1680	839	2761	1019	782	1064	657	1892	2875
1995	11506	2473	6726	11602	1601	1846	922	3036	1118	918	1135	697	2207	3552
2005	12969	2657	7274	12415	1848	2014	1006	3312	1218	1050	1235	757	2504	4257
2015	14415	2851	7834	13214	2100	2183	1090	3589	1319	1210	1338	815	2791	5000
2025	15743	3048	8389	13895	2326	2347	1172	3858	1417	1354	1431	867	3054	5656
PA LEBANON			PARTICIPANTS											
1974	70577	68327	69808	49596	33733	30556	14059	39313	25207	10934	11427	21882	33489	29743
1985	81897	76696	78618	55918	40408	34353	15806	43976	28176	11546	12848	24221	42025	38957
1995	92044	84285	86203	62053	46519	37923	17449	48165	30998	12280	14183	26623	49288	47454
2005	102035	91958	94054	67828	52687	41555	19120	52331	33849	13153	15541	29093	56342	55996
2015	111231	99006	101144	73337	58498	44856	20639	56224	36495	13993	16776	31429	62776	64295
2025	119964	105967	108192	78411	63876	48150	22155	60018	39088	14701	18008	33516	68750	71617
			ACTIVITY DAYS											
1974	2399	595	1641	3025	309	448	224	732	273	193	292	183	445	607
1985	2937	671	1848	3041	394	504	252	823	305	223	310	189	560	825
1995	3422	733	1990	3358	474	556	278	909	336	264	332	202	660	1035
2005	3890	791	2164	3599	553	609	304	996	368	307	363	220	755	1266
2015	4322	847	2322	3822	631	658	329	1075	397	361	392	236	841	1508
2025	4720	902	2479	3990	701	706	353	1154	426	404	418	250	921	1711
PA LENIGH & NORTHAMPTON			PARTICIPANTS											
1974	320388	317505	324708	224327	152459	141225	65118	181447	116110	49372	52704	98673	150875	132051
1985	396613	379470	389306	264554	194347	169056	77950	216120	138197	55508	63090	116203	199250	182619
1995	407484	379675	388628	273079	204533	169928	78352	215487	138440	53715	63415	116572	213907	203284
2005	452942	414566	424332	299809	231729	186156	85835	234506	151266	57797	69472	128017	245255	239837
2015	504835	455651	465876	331592	262508	205102	94570	257259	166499	62850	76542	141681	279862	280879
2025	547429	489086	494632	356694	288350	220747	101784	275501	178866	66411	82380	152128	309098	315887
			ACTIVITY DAYS											
1974	10729	2745	7614	13512	1389	2073	1036	3406	1258	871	1330	828	1998	2696
1985	13944	3299	9127	14454	1869	2481	1240	4077	1497	1074	1505	915	2650	3849
1995	14868	3279	8960	14491	2045	2494	1247	4098	1503	1144	1470	888	2851	4391
2005	16455	3547	9745	15645	2308	2732	1366	4489	1645	1317	1608	971	3274	5341
2015	19280	3879	10678	16965	2777	3010	1505	4946	1812	1548	1776	1067	3737	6444
2025	21227	4146	11436	17848	3107	3240	1620	5323	1948	1737	1900	1134	4131	7383
PA LUZERNE			PARTICIPANTS											
1974	225176	226226	230887	154673	106915	97542	47199	126259	79647	33134	36060	67073	105343	91377
1985	236054	226605	231907	155980	115946	97915	47380	125992	79460	31170	36198	66741	119536	109234
1995	247446	230117	234956	162124	124967	99885	48333	127495	80782	30650	36926	68269	131816	125706
2005	256862	233895	238845	166297	132707	101767	49244	129252	82158	30792	37622	70067	141728	140323
2015	265352	238313	243076	170490	139266	103952	50301	131411	83817	30999	38430	71865	149897	151958
2025	273595	243421	248068	174702	145242	106401	51486	133995	85674	31312	39335	73528	157016	161795
			ACTIVITY DAYS											
1974	7465	1925	5379	9088	967	1436	751	2460	861	595	896	560	1398	1833
1985	8316	1938	5409	8123	1117	1441	754	2470	859	613	848	518	1595	2265
1995	9104	1955	5396	8288	1260	1470	769	2519	875	675	841	511	1762	2696
2005	9738	1971	5466	8341	1390	1498	784	2567	891	750	859	521	1896	3146
2015	10264	1998	5552	8382	1496	1530	801	2622	910	812	878	530	2008	3496
2025	10726	2035	5664	8435	1586	1566	820	2684	930	869	895	537	2104	3788
PA LYCOMING			PARTICIPANTS											
1974	76415	75427	76941	54038	36283	33531	15465	43210	27650	12106	12514	23923	35853	31297
1985	82055	77589	79409	56114	40398	34567	15943	44271	28320	11683	12901	24355	41809	38644
1995	88434	81272	82988	59634	44761	36360	16769	46231	29698	11875	13570	25628	47309	45704
2005	94364	84999	86798	62674	49025	38181	17609	48161	31087	12218	14250	26914	52352	52685
2015	99771	88763	90538	65695	52658	39988	18443	50170	32507	12572	14924	28193	56546	58244
2025	104462	92211	93987	68295	55726	41645	19207	52008	33795	12879	15542	29263	60044	62735
			ACTIVITY DAYS											
1974	2558	653	1809	3386	329	492	246	809	299	212	323	203	473	638
1985	2926	675	1867	3114	393	507	254	834	307	225	314	192	557	817
1995	3287	703	1919	3281	457	534	267	877	322	258	321	196	632	1003
2005	3615	727	2000	3380	521	560	280	921	338	297	336	205	700	1213
2015	3892	755	2081	3470	572	587	293	964	354	330	352	213	756	1375
2025	4122	781	2159	3534	614	611	306	1004	368	355	365	220	803	1503
PA MONROE			PARTICIPANTS											
1974	31204	32988	33675	22393	14490	14984	6770	18958	12297	5175	5615	9919	13466	11137
1985	45065	45523	46613	31167	21426	20722	9362	26062	16901	6712	7765	13485	20742	17779
1995	60189	58766	60031	40961	29332	26872	12141	33532	21845	8386	10070	17539	29278	26118
2005	76032	72268	73841	50955	37852	33160	14982	41091	26483	10137	12426	21881	38839	35809
2015	95490	89015	90854	63389	48366	40954	18504	50503	33152	12339	15347	27234	50416	47786
2025	115100	105606	107661	75658	59272	48743	22023	59762	39377	14406	18265	32459	62449	60708
			ACTIVITY DAYS											
1974	976	284	793	1419	123	220	108	354	134	87	141	87	179	221
1985	1474	394	1098	1753	189	304	149	490	184	119	184	111	274	355
1995	2060	506	1389	2276	271	394	193	635	238	160	232	139	387	531
2005	2707	616	1702	2750	364	486	238	784	293	199	286	171	517	747
2015	3494	755	2091	3346	480	600	294	968	362	257	352	210	673	1024
2025	4307	890	2472	3902	604	714	350	1153	430	322	417	247	835	1336

IDE ASSOCIATES, INC.

TABLE 4.A.7b--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--HIGH GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS, PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA MONTGOMERY			PARTICIPANTS											
1974	450340	415372	424976	312330	225042	189138	83159	240712	155890	66484	70985	138075	235064	223935
1985	509989	460871	473254	344361	262390	210139	92393	266157	172178	69035	78867	148867	278951	278291
1995	554530	498468	511171	374137	293381	228393	100416	287242	186576	72572	85718	160111	314244	322567
2005	602239	536428	549639	399211	317132	246696	108466	307593	200851	76672	92587	171119	339734	348980
2015	643284	568269	581597	423962	342725	261949	115172	325268	213070	80475	98312	181793	368125	384850
2025	679110	597112	610757	444694	364694	275930	121306	341073	224039	83344	103547	190285	391934	413989
			ACTIVITY DAYS											
1974	16483	3607	9929	18590	2246	2771	1322	4399	1693	1317	1794	1114	3105	4918
1985	19356	4029	11042	18365	2757	3079	1469	4888	1870	1591	1876	1134	3706	6382
1995	21725	4336	11734	19998	3174	3346	1597	5312	2030	1864	1985	1195	4182	7583
2005	23434	4608	12577	21131	3430	3614	1725	5738	2190	1971	2141	1286	4521	8205
2015	25339	4859	13283	22157	3769	3838	1831	6093	2325	2196	2278	1363	4897	9232
2025	26929	5086	13936	22813	4046	4042	1929	6417	2447	2375	2387	1419	5209	10047
PA MONTOUR			PARTICIPANTS											
1974	11562	11653	11861	7979	5528	5193	2440	6567	4229	1729	1933	3471	5400	4687
1985	14084	13581	13861	9408	6952	6067	2850	7623	4909	1888	2259	4008	7098	6470
1995	16001	14950	15228	10538	8101	6702	3148	8368	5408	2006	2495	4440	8468	8035
2005	18557	16973	17303	12037	9613	7632	3585	9466	6141	2229	2841	5065	10183	10021
2015	20381	18367	18711	13127	10721	8271	3886	10229	6652	2387	3079	5528	11460	11563
2025	22102	19712	20059	14101	11782	8909	4185	10944	7146	2505	3317	5914	12657	12994
			ACTIVITY DAYS											
1974	383	99	277	480	50	76	39	127	46	31	47	29	72	94
1985	495	116	324	500	66	89	45	148	53	37	52	31	95	134
1995	586	127	349	554	81	98	50	164	59	44	56	33	113	171
2005	701	143	394	619	99	112	57	187	67	54	63	38	136	222
2015	786	154	425	662	114	121	62	202	73	62	68	41	154	264
2025	865	164	454	695	127	131	67	218	78	69	73	43	170	302
PA NORTHUMBERLAND			PARTICIPANTS											
1974	63171	65233	66512	43896	29744	29294	13656	36913	23849	9628	10930	19062	28433	23978
1985	71281	69659	71212	47804	34762	31345	14612	39278	25374	9665	11696	20329	35027	31214
1995	80061	75221	76729	52906	40236	33958	15831	42318	27428	10158	12670	22288	41722	39067
2005	87451	80148	81773	56900	45092	36315	16929	44921	29245	10642	13550	23979	47580	46408
2015	93752	84492	86107	60534	49180	38369	17887	47270	30870	11105	14316	25554	52515	52621
2025	99383	88578	90184	63696	52844	40323	18798	49456	32391	11491	15045	26848	56742	57988
			ACTIVITY DAYS											
1974	2030	555	1548	2676	260	430	217	710	259	169	263	162	380	471
1985	2448	596	1658	2560	324	460	233	760	276	184	266	160	467	633
1995	2893	641	1761	2783	394	498	252	823	298	217	282	168	556	822
2005	3276	676	1869	2922	462	533	269	881	319	250	300	180	636	1023
2015	3601	709	1966	3040	519	563	285	930	337	280	318	189	704	1193
2025	3879	741	2058	3130	569	592	299	978	353	310	333	197	761	1343
PA PHILADELPHIA & DELAWARE			PARTICIPANTS											
1974	1610776	1551865	1608896	1125274	764407	626351	251880	868845	520663	247460	227738	496488	783612	709246
1985	1743366	1631676	1696771	1185577	851034	659498	265209	910560	544958	245902	239790	513125	896581	846547
1995	1811970	1659320	1721705	1215904	904388	673768	270948	922566	554626	241093	244978	520300	967325	942883
2005	1868534	1684735	1748264	1237387	949753	686873	276218	932806	563415	240556	249743	529383	1024858	1023710
2015	1912869	1703708	1766144	1257407	986550	696230	279984	941411	570426	240591	251149	537814	1070098	1092345
2025	1931976	1705892	1766884	1261219	1007069	698851	281035	940601	571568	237687	254099	538412	1096024	1134644
			ACTIVITY DAYS											
1974	55532	13380	37966	67467	7329	9264	3969	15146	5552	4485	6341	4077	9483	14933
1985	62683	14154	40080	63810	8574	9754	4179	15947	5811	4962	6316	3973	10988	18429
1995	67212	14307	39934	64867	9430	9965	4270	16292	5927	5373	6240	3901	11935	20989
2005	70843	14361	40360	64996	10153	10159	4353	16609	6035	5718	6341	3963	12690	23384
2015	73741	14455	40688	64875	10773	10298	4412	16836	6116	6137	6433	3999	13275	25571
2025	75339	14417	40641	63930	11149	10336	4429	16899	6132	6387	6425	3972	13609	26952
PA PIKE			PARTICIPANTS											
1974	8531	8584	8723	5801	4158	3991	1811	4864	3218	1224	1497	2495	4052	3553
1985	13260	12802	13030	8721	6666	5976	2712	7217	4785	1697	2242	3667	6759	6205
1995	20552	19244	19530	13270	10602	9040	4102	10794	7203	2418	3391	5496	10988	10470
2005	28023	25719	26103	17781	14756	12144	5511	14353	9636	3123	4556	7337	15504	15231
2015	35670	32272	32706	22411	19089	15293	6940	17955	12107	3833	5737	9234	20220	20314
2025	43251	38720	39181	26885	23446	18428	8362	21463	14545	4463	6913	11022	24969	25492
			ACTIVITY DAYS											
1974	286	72	203	342	37	58	29	94	35	23	34	21	54	71
1985	469	108	303	456	63	88	43	141	52	35	48	28	90	128
1995	757	161	444	682	105	132	65	214	79	56	70	40	147	221
2005	1061	212	588	894	151	178	88	287	106	79	92	53	208	332
2015	1379	264	733	1100	200	224	110	361	133	104	115	66	271	454
2025	1697	315	875	1288	250	270	133	436	160	130	137	78	335	579
PA SCHUYLKILL			PARTICIPANTS											
1974	111799	103190	106869	74952	55773	45613	16629	58496	37143	15146	16890	32378	58321	54846
1985	110764	112573	115089	74567	52796	49092	23661	62602	39739	15267	18178	31525	51564	44472
1995	120353	119523	122012	80110	58232	52345	25229	66252	42222	15972	19383	33731	58240	51146
2005	133796	129453	132109	87142	66163	57073	27506	71279	45762	16611	21133	36532	67668	61077
2015	150357	141560	144473	95762	76344	62793	30265	77528	50034	17395	23251	39870	79651	74559
2025	159650	143169	145803	100750	84713	63513	30612	78411	50713	17872	23518	42123	91141	92480
			ACTIVITY DAYS											
1974	4057	871	2476	4213	553	671	262	1013	402	306	412	252	707	1171
1985	3637	959	2668	4042	473	722	377	1231	430	287	418	254	686	880
1995	4076	1011	2812	4339	534	770	402	1313	458	302	438	267	777	1010
2005	4690	1077	3010	4594	626	840	438	1431	498	326	466	284	904	1225
2015	5473	1165	3280	4817	749	924	482	1575	546	373	506	300	1064	1547
2025	6214	1177	3316	4927	908	936	487	1593	552	477	517	310	1222	2115

IDE ASSOCIATES, INC.

TABLE 4.A.7b—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—HIGH GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA SNYDER			PARTICIPANTS											
1974	20684	20707	21171	14924	9699	9325	4229	12034	7740	3482	3490	6719	9434	8141
1985	27344	26140	26830	19043	13287	11790	5346	15137	9724	4130	4422	8395	13578	12388
1995	31911	29547	30248	21858	15972	13394	6074	17047	11007	4501	5024	9523	16717	15965
2005	36406	33005	33783	24556	18706	15026	6814	18966	12308	4949	5636	10690	19826	19718
2015	40811	36511	37328	27297	21309	16670	7559	20932	13635	5401	6253	11882	22753	23178
2025	45007	39918	40788	29900	23767	18263	8281	22846	14916	5831	6850	12992	25483	26380
			ACTIVITY DAYS											
1974	678	181	505	945	87	137	67	220	84	59	93	58	125	169
1985	956	230	640	1063	127	173	85	279	105	76	111	68	181	264
1995	1167	259	706	1208	160	196	97	317	119	93	122	74	223	351
2005	1375	286	786	1332	196	220	108	355	134	113	137	83	265	453
2015	1572	314	866	1453	228	244	120	394	148	133	152	92	305	546
2025	1756	342	944	1562	259	268	132	432	163	151	165	100	341	631
PA SULLIVAN			PARTICIPANTS											
1974	3715	3889	3954	2655	1763	1796	808	2235	1467	610	674	1179	1675	1448
1985	3881	3865	3943	2667	1904	1788	804	2212	1452	569	671	1155	1881	1711
1995	4729	4526	4605	3185	2390	2106	948	2580	1703	640	791	1358	2425	2299
2005	4871	4544	4622	3222	2513	2124	956	2578	1711	626	798	1372	2602	2537
2015	5701	5213	5296	3732	2993	2446	1100	2950	1967	706	919	1591	3149	3144
2025	5793	5225	5302	3754	3084	2459	1106	2948	1972	694	923	1596	3270	3328
			ACTIVITY DAYS											
1974	121	33	93	174	16	26	13	42	16	10	17	10	23	29
1985	133	33	93	154	18	26	13	42	16	11	16	9	25	36
1995	170	39	106	181	23	31	15	49	19	14	18	11	32	50
2005	180	38	106	178	25	31	15	50	19	14	18	11	35	56
2015	217	44	120	202	31	36	18	57	22	17	20	12	42	71
2025	225	43	120	198	33	36	18	58	22	18	20	12	44	77
PA SUSQUEHANNA			PARTICIPANTS											
1974	23762	24087	24554	17008	11181	10765	4978	13835	8878	3898	4024	7550	10845	9364
1985	29776	28923	29582	20598	14464	12952	5988	16551	10615	4401	4841	8949	14636	13265
1995	37354	35128	35840	25165	18721	15883	7344	19934	12919	5040	5936	10809	19398	18299
2005	43101	39692	40496	28862	22003	17942	8295	22532	14597	5709	6706	12382	23130	22566
2015	49068	44482	45325	32533	25481	20172	9327	25181	16385	6292	7540	13964	27067	27080
2025	54851	49185	50079	36048	28856	22367	10342	27777	18131	6839	8360	15436	30832	31408
			ACTIVITY DAYS											
1974	780	209	577	1099	100	158	79	259	96	67	103	65	145	191
1985	1032	252	696	1183	137	190	95	312	115	83	117	72	196	278
1995	1353	300	823	1413	185	233	117	382	141	105	139	85	260	392
2005	1606	339	930	1604	225	263	132	432	159	129	157	96	310	502
2015	1870	378	1038	1763	268	296	148	485	178	152	176	107	363	618
2025	2123	416	1144	1909	309	328	165	538	198	175	194	117	414	730
PA UNION			PARTICIPANTS											
1974	19918	19743	20234	14293	9386	8903	3957	11499	7391	3309	3340	6434	9242	8073
1985	24196	23052	23706	16804	11767	10412	4627	13379	8592	3631	3906	7399	12027	11022
1995	28623	26480	27168	19590	14295	12015	5340	15317	9882	4026	4508	8524	14913	14215
2005	32874	29830	30563	22107	16822	13632	6059	17155	11153	4429	5115	9609	17769	17461
2015	37322	33418	34242	25022	19344	15259	6782	19226	12501	4973	5725	10914	20629	20779
2025	41487	36831	37716	27619	21763	16856	7491	21149	13787	5401	6324	12021	23315	23896
			ACTIVITY DAYS											
1974	661	174	485	874	86	130	63	208	80	57	89	55	122	170
1985	845	204	567	912	113	153	74	244	93	69	98	60	159	239
1995	1041	233	638	1049	143	176	85	281	107	84	110	66	197	314
2005	1231	258	714	1164	174	200	96	319	121	100	123	74	235	398
2015	1426	289	800	1299	205	224	108	357	136	118	140	84	274	485
2025	1607	318	879	1407	235	247	119	394	150	136	153	92	310	567
PA WAYNE			PARTICIPANTS											
1974	20800	21321	21697	14511	9897	9698	4435	12125	7893	3199	3628	6317	9522	8185
1985	26335	25629	26147	17708	12970	11692	5347	14512	9453	3597	4374	7531	13080	11836
1995	34412	32262	32867	22788	17426	14758	6749	18228	11906	4383	5520	9582	18045	17083
2005	42604	39016	39817	27860	22042	17861	8168	22003	14395	5253	6681	11747	23214	22796
2015	50844	45798	46696	32960	26745	21016	9610	25774	16916	6082	7861	13912	28503	28702
2025	58921	52509	53537	37947	31361	24119	11029	29517	19401	6897	9022	16003	33610	34479
			ACTIVITY DAYS											
1974	679	182	506	903	88	142	71	232	86	57	87	54	127	164
1985	914	219	610	972	122	171	85	279	103	71	99	59	174	244
1995	1252	275	752	1229	172	216	107	353	130	97	121	72	240	364
2005	1601	330	909	1465	227	262	130	427	157	125	147	88	310	506
2015	1957	385	1063	1690	283	308	153	502	185	155	174	103	381	654
2025	2302	441	1218	1900	338	354	176	576	212	187	199	118	450	803
PA WYOMING			PARTICIPANTS											
1974	13448	13664	13939	9656	6315	6188	2818	7899	5104	2229	2321	4297	6102	5229
1985	15921	15486	15851	11042	7724	7029	3199	8920	5760	2374	2634	4810	7786	7025
1995	17826	16778	17139	12178	8883	7639	3478	9638	6246	2494	2865	5243	9173	8633
2005	20449	18814	19212	13722	10446	8614	3922	10753	7012	2735	3230	5904	10956	10685
2015	23110	20901	21317	15363	12020	9597	4370	11919	7801	2998	3599	6615	12758	12787
2025	24935	22298	22729	16437	13144	10262	4673	12689	8329	3151	3848	7064	14037	14341
			ACTIVITY DAYS											
1974	439	119	330	619	56	91	45	147	55	38	59	37	82	108
1985	549	136	375	627	73	103	51	166	62	44	64	39	104	147
1995	642	146	398	685	87	112	55	181	68	52	67	41	123	186
2005	761	162	445	751	107	126	62	204	76	61	75	46	147	239
2015	881	179	492	822	127	141	70	227	85	72	84	51	171	296
2025	967	190	524	858	141	150	74	243	91	81	89	53	188	336

IDE ASSOCIATES, INC.

TABLE 4.A.7b--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--HIGH GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA YORK			PARTICIPANTS											
1974	193506	185726	189921	135676	93368	83353	37542	107009	68729	29732	31185	59934	96341	84469
1985	230363	214639	220276	157202	114580	96402	43420	123307	79077	32363	36067	68158	119623	112666
1995	267162	243928	249764	180034	136003	110077	49579	139646	89972	35597	41183	77283	144304	140920
2005	301369	271304	277806	200267	156471	123003	55400	154639	100155	38880	46019	85903	167315	167995
2015	339950	302832	309723	224596	179081	137507	61933	172402	111950	42982	51446	96315	191937	197576
2025	373154	330050	337313	244719	198657	150256	67675	187478	122105	46119	56216	104710	213480	222916
			ACTIVITY DAYS											
1974	6683	1614	4465	8224	870	1222	597	1976	745	532	795	496	1239	1747
1985	8355	1879	5176	8518	1135	1414	691	2285	857	643	870	530	1588	2428
1995	10015	2121	5769	9723	1403	1614	789	2609	977	790	964	584	1924	3128
2005	11554	2331	6395	10650	1659	1804	881	2916	1090	931	1073	650	2233	3847
2015	13226	2594	7111	11730	1942	2016	985	3260	1219	1123	1204	724	2558	4667
2025	14675	2816	7734	12519	2184	2203	1077	3562	1330	1271	1308	782	2844	5346
NJ TOTAL			PARTICIPANTS											
1974	6738120	4451925	4578299	3309918	2317902	1949763	840568	2558612	1614234	717290	725349	1462764	2400908	2241996
1985	5763091	5240325	5446869	3923667	2905649	2322735	1001101	3028992	1912375	803150	864808	1699768	3074953	3009753
1995	6623700	5969335	6144181	4461717	3407933	2642256	1139570	3416866	2168597	880273	984350	1911965	3640660	3671553
2005	7444282	6624612	6817195	4951402	3899354	2949657	1272668	3778578	2412560	959663	1099309	2120812	4189100	4326028
2015	8163674	7212996	7414559	5396624	4318074	3223225	1391244	4107096	2632920	1031985	1201601	2311668	4648286	4863350
2025	8795136	7734637	7945447	5780632	4683348	3466720	1496822	4396560	2827398	1090997	1292626	2473297	5050387	5324745
			ACTIVITY DAYS											
1974	169232	38799	107464	197912	22753	28642	13337	45948	17427	13661	18913	11892	31012	48482
1985	214267	46334	127807	211350	30059	34112	15886	54621	20657	17542	21302	13071	40039	68010
1995	252560	52125	141665	240086	36348	38798	18086	62062	23472	21431	23507	14342	47564	85005
2005	289335	57219	156595	262012	42557	43306	20200	69226	26173	25059	26143	15910	54809	102749
2015	320368	61998	169908	280994	47695	47319	22083	75608	28596	28238	28564	17278	60825	117180
2025	347423	66241	181783	295505	52113	50890	23760	81291	30735	30796	30577	18378	66121	129252
NJ BERGEN			PARTICIPANTS											
1974	648731	596424	610978	444655	326671	270882	120355	343958	222528	92461	101568	195132	343294	330368
1985	733641	663161	681595	491489	378863	301375	133903	381448	246393	96894	113001	211230	403267	404318
1995	820255	732470	751493	544363	431041	334068	148429	420176	272382	103805	125259	231539	461586	475258
2005	901756	798922	819392	592758	479799	365791	162524	456696	297439	111709	137154	252310	515258	538991
2015	971555	856629	877564	635948	520460	393073	174645	488859	319367	118708	147384	270931	559328	590464
2025	1041345	915248	937096	677617	560851	420962	187037	521217	341626	124723	157841	288107	603399	640441
			ACTIVITY DAYS											
1974	23975	5163	14205	25605	3301	3970	1914	6346	2418	1882	2513	1552	4560	7287
1985	27929	5782	15834	25571	4000	4417	2130	7061	2678	2286	2649	1596	5373	9309
1995	31866	6356	17177	28335	4674	4896	2361	7827	2965	2726	2858	1713	6155	11204
2005	35466	6862	18678	30523	5281	5361	2585	8570	3244	3082	3131	1875	6870	12932
2015	38448	7325	19967	32395	5775	5760	2778	9209	3486	3392	3374	2011	7451	14318
2025	41405	7798	21290	33823	6255	6169	2975	9862	3729	3662	3588	2124	8037	15607
NJ ESSEX			PARTICIPANTS											
1974	577736	550160	571600	403471	277588	225479	86389	310632	187495	88163	82315	177871	286525	265708
1985	655379	606826	632432	445483	323646	249035	95414	341497	205473	91838	90915	192584	342238	330111
1995	687026	623033	648100	460732	346519	256822	98398	349352	211476	90796	93758	196669	371245	368590
2005	712676	637504	663197	471591	365491	263892	101106	355953	216503	90995	96339	201110	394404	399952
2015	731463	648538	674053	480088	374755	269360	103201	361044	220456	90950	98335	204393	411515	423428
2025	750427	660251	685664	489252	392672	274880	105316	366792	224632	91344	100350	208127	426827	443747
			ACTIVITY DAYS											
1974	20262	4763	13462	24057	2725	3331	1359	5295	2003	1679	2264	1445	3450	5754
1985	23894	5285	14908	23819	3326	3679	1501	5849	2200	1954	2367	1477	4166	7378
1995	25776	5395	14990	24438	3671	3794	1548	6032	2264	2140	2355	1461	4544	8394
2005	27250	5461	15276	24475	3956	3898	1591	6198	2323	2280	2407	1488	4842	9309
2015	28342	5522	15484	24418	4170	3979	1624	6326	2369	2400	2443	1501	5061	9999
2025	29332	5597	15713	24475	4357	4061	1657	6456	2416	2506	2485	1518	5256	10586
NJ HUDSON			PARTICIPANTS											
1974	413949	402006	413769	286070	194843	153370	76398	219332	127690	61751	55058	125132	201348	181217
1985	438447	411879	425079	294674	213039	157422	78417	223907	130233	59672	56513	126452	226949	214099
1995	468796	430112	442891	310786	233431	165184	82283	232874	136088	60183	59299	131961	252574	246664
2005	498831	450086	463523	326620	253454	173385	86368	242849	142448	61922	62243	138593	276587	278167
2015	529494	472072	485597	344389	272912	182269	90794	254215	149580	64326	65433	146127	299263	307357
2025	557495	493059	506816	359911	290466	190865	95076	264856	156303	66106	68519	152399	319557	332680
			ACTIVITY DAYS											
1974	14220	3470	9748	16535	1876	2277	1212	4179	1353	1131	1562	1025	2585	3789
1985	15801	3574	10013	15218	2166	2337	1244	4289	1380	1221	1513	973	2938	4643
1995	17477	3706	10256	15936	2461	2452	1305	4501	1445	1373	1537	984	3283	5488
2005	19047	3844	10689	16396	2751	2574	1370	4724	1516	1535	1610	1029	3600	6395
2015	20552	4015	11177	17022	3023	2706	1441	4967	1593	1708	1694	1078	3898	7232
2025	21889	4176	11651	17386	3261	2833	1508	5201	1666	1847	1763	1114	4164	7936
NJ HUNTERDON			PARTICIPANTS											
1974	53176	49913	51000	37281	26205	22828	10133	29028	18833	8078	8581	16474	26974	25104
1985	75965	69422	71182	51768	38684	31798	14115	40232	26083	10542	11953	22412	40815	40056
1995	103999	93431	95598	70123	54103	42960	19070	53998	35143	13786	16149	30094	57681	58519
2005	130855	116280	118970	87141	69248	53691	23833	66940	43785	16863	20182	37331	74068	76960
2015	154888	136690	139693	102601	82717	63260	28081	78547	51544	19622	23780	43996	88691	93330
2025	180805	158903	162283	119005	97182	73734	32730	91106	59969	22454	27717	50965	104369	110585
			ACTIVITY DAYS											
1974	1903	436	1192	2280	254	334	161	531	205	153	216	134	358	538
1985	2843	610	1663	2830	399	466	225	740	283	232	284	172	545	903
1995	3999	816	2197	3829	578	629	303	1000	382	341	374	226	772	1359
2005	5115	1005	2725	4681	756	786	379	1249	477	450	467	281	990	1838
2015	6113	1175	3194	5432	914	926	447	1472	562	547	551	330	1185	2259
2025	7179	1361	3707	6172	1081	1080	521	1716	655	644	639	380	1394	2695

THE ASSOCIATES, INC.

TABLE 4.A.7b—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—HIGH GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING
NJ MERCER			PARTICIPANTS				
1974	221616	208347	215027	154449	108117	91704	37346
1985	271947	248696	257581	184591	136848	109530	44606
1995	321908	288898	298559	215705	165668	127838	52062
2005	379046	335970	347200	250545	198644	149380	60835
2015	425234	374026	386193	279078	225152	166744	67906
2025	469975	411265	424344	306516	250661	183799	74852
			ACTIVITY DAYS				
1974	7863	1811	5075	9075	1053	1347	591
1985	10075	2178	6076	9744	1411	1609	706
1995	12274	2514	6908	11339	1767	1878	824
2005	14731	2889	7998	12975	2167	2194	963
2015	16700	3199	8875	14161	2489	2449	1075
2025	18593	3504	9728	15279	2794	2700	1185
NJ MIDDLESEX			PARTICIPANTS				
1974	428860	398286	409198	305062	209570	178226	77965
1985	534806	485772	501189	370901	269898	217295	95056
1995	634423	567998	584717	435404	327029	255113	111599
2005	719079	637765	656362	486835	377022	288029	125998
2015	797349	703582	723336	536490	421382	318501	139328
2025	872280	767113	788328	583935	463501	348040	152250
			ACTIVITY DAYS				
1974	15436	3530	9633	18634	2061	2612	1239
1985	20056	4344	11784	20393	2823	3184	1511
1995	24393	5052	13483	23977	3538	3738	1774
2005	28082	5599	15083	26418	4159	4221	2003
2015	31340	6149	16577	28751	4690	4667	2215
2025	34449	6679	18032	30651	5186	5100	2420
NJ MONMOUTH			PARTICIPANTS				
1974	336710	316199	324270	238002	165265	142198	60532
1985	427690	391491	402937	293896	216282	176307	75051
1995	512595	461013	473456	348375	264587	208485	88749
2005	586839	521674	535737	393871	307899	236909	100849
2015	655403	578392	593400	436639	347294	263448	112146
2025	713094	626285	642158	472202	380439	285917	121711
			ACTIVITY DAYS				
1974	12045	2770	7622	14772	1621	2089	961
1985	15916	3452	9466	16364	2235	2585	1192
1995	19592	4043	10931	19407	2822	3056	1409
2005	22819	4524	12327	21523	3353	3473	1601
2015	25739	4987	13615	23389	3828	3862	1781
2025	28196	5381	14720	24831	4226	4192	1932
NJ MORRIS			PARTICIPANTS				
1974	282037	258968	265580	199249	141092	118160	51767
1985	343046	308117	317157	235649	176677	140660	61625
1995	439902	390499	401101	294456	230597	178932	78392
2005	530842	468520	481140	357244	281560	215744	94520
2015	599817	527576	541259	401547	319905	243596	106722
2025	655280	575232	589917	436365	350754	266152	116604
			ACTIVITY DAYS				
1974	10434	2295	6226	12053	1427	1729	824
1985	13123	2749	7423	12854	1890	2059	980
1995	17162	3469	9219	16396	2533	2619	1247
2005	20901	4112	11022	19287	3126	3158	1504
2015	23728	4605	12370	21347	3570	3565	1698
2025	25994	5004	13455	22737	3925	3896	1855
NJ OCEAN			PARTICIPANTS				
1974	171162	167847	170930	117879	83584	77355	34344
1985	286171	269520	275108	190976	144585	124561	55303
1995	356519	326662	332748	234516	184748	151597	67306
2005	410756	369483	376487	265885	217602	172207	76456
2015	451181	401194	408459	289626	242226	187472	83233
2025	478589	422284	429662	305033	259420	197792	87815
			ACTIVITY DAYS				
1974	9872	1432	4019	7123	772	1134	546
1985	10369	2309	6478	10270	1421	1825	880
1995	13410	2782	7706	12425	1894	2222	1070
2005	15875	3112	8685	13699	2306	2524	1216
2015	17719	3362	9404	14576	2618	2747	1324
2025	18998	3523	9882	14983	2841	2899	1397
NJ PASSAIC			PARTICIPANTS				
1974	321153	304772	313759	222340	156168	131818	57435
1985	362535	334991	345419	245261	181401	145217	63273
1995	395749	359160	369971	263811	202398	156351	68124
2005	438192	392620	404422	289509	227510	171286	74632
2015	474893	421488	433709	311326	249783	184394	80343
2025	501784	442482	454979	326644	266314	194085	84565
			ACTIVITY DAYS				
1974	11330	2641	7367	13029	1511	1939	911
1985	13328	2911	8105	13143	1847	2136	1004
1995	14966	3107	8555	13899	2132	2299	1081
2005	16874	3373	9319	14994	2453	2519	1184
2015	18531	3601	9967	15817	2741	2712	1274
2025	19761	3765	10442	16249	2954	2854	1341

AREA YEAR	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ MERCER		PARTICIPANTS					
1974	120018	75851	33562	34123	68606	111624	103456
1985	142877	90125	37816	40756	80090	144765	141063
1995	165381	104799	42328	47568	92436	177242	178484
2005	191466	121974	48248	55586	107193	213677	220365
2015	212658	135955	52921	62045	119388	242809	253899
2025	233333	149589	57252	68392	130825	270872	285645
		ACTIVITY DAYS					
1974	2107	819	628	892	556	1410	2228
1985	2516	973	815	1009	615	1846	3181
1995	2937	1134	1027	1138	689	2269	4129
2005	3431	1323	1260	1321	799	2739	5228
2015	3830	1476	1452	1474	886	3113	6115
2025	4222	1625	1629	1613	964	3474	6932
NJ MIDDLESEX		PARTICIPANTS					
1974	233241	148698	67521	66842	136597	218233	204230
1985	283838	180456	77722	81494	162670	286724	283768
1995	330923	211249	88060	95678	188884	350258	358373
2005	369768	237487	96907	108022	210976	404936	423238
2015	407164	262349	105692	119451	232715	452628	478292
2025	443024	286205	113434	130529	252687	498444	529721
		ACTIVITY DAYS					
1974	4143	1609	1242	1777	1119	2874	4433
1985	5051	1952	1682	2052	1263	3802	6522
1995	5931	2290	2152	2342	1434	4655	8481
2005	6696	2580	2532	2630	1608	5378	10252
2015	7404	2853	2881	2912	1770	6002	11734
2025	8091	3115	3173	3164	1911	6609	13064
NJ MONMOUTH		PARTICIPANTS					
1974	184007	117859	52497	53254	105704	170344	159705
1985	227033	145271	61053	66028	127773	227959	223785
1995	266561	171256	69401	78079	149846	281836	285121
2005	300435	193999	77577	88724	169477	329689	340837
2015	332258	215370	84622	98664	187784	372823	390352
2025	359060	233363	90368	107078	202823	409225	431827
		ACTIVITY DAYS					
1974	3277	1275	1008	1381	867	2215	3480
1985	4063	1573	1340	1616	989	2982	5083
1995	4804	1857	1702	1898	1132	3695	6628
2005	5459	2108	2014	2109	1281	4324	8114
2015	6071	2343	2300	2341	1412	4889	9417
2025	6588	2540	2534	2528	1516	5367	10496
NJ MORRIS		PARTICIPANTS					
1974	152137	98135	43216	44486	88480	148320	142706
1985	180474	116235	48394	52956	102417	188380	191138
1995	228143	147471	59544	67365	128716	247119	257632
2005	272519	177157	70088	81224	153521	301888	318914
2015	306189	199762	77881	91710	172732	343316	364807
2025	333208	217934	83552	100202	187478	376674	401447
		ACTIVITY DAYS					
1974	2722	1064	857	1139	712	1973	3172
1985	3240	1261	1144	1285	783	2515	4496
1995	4122	1603	1568	1589	964	3302	6202
2005	4970	1929	1931	1910	1156	4028	7792
2015	5612	2178	2196	2159	1298	4580	8967
2025	6131	2378	2398	2346	1401	5025	9892
NJ OCEAN		PARTICIPANTS					
1974	95933	62844	25380	29006	51167	83210	74308
1985	153422	100584	38333	46707	81264	149330	140657
1995	185350	122047	44868	56844	98748	194335	190366
2005	208734	138125	49544	64572	111724	231398	234025
2015	226133	150133	52943	70296	121567	259064	267092
2025	237504	158168	54872	74166	127979	278432	290768
		ACTIVITY DAYS					
1974	1811	683	471	687	421	1098	1520
1985	2917	1094	805	1047	624	1980	3008
1995	3550	1329	1063	1238	733	2581	4207
2005	4033	1508	1287	1396	823	3077	5358
2015	4390	1640	1468	1515	888	3446	6244
2025	4632	1729	1594	1595	928	3705	6893
NJ PASSAIC		PARTICIPANTS					
1974	173510	108726	47747	48847	97522	160879	148076
1985	190092	119204	49966	53813	105994	191399	184216
1995	203062	127770	51533	57919	112439	216205	214839
2005	221474	139785	55676	63473	123517	244636	248718
2015	237188	150249	58892	68330	132705	269357	279030
2025	248431	157844	60849	71921	138958	287913	301611
		ACTIVITY DAYS					
1974	3151	1172	895	1258	791	2068	3146
1985	3472	1286	1091	1320	818	2479	4073
1995	3738	1380	1214	1375	841	2811	4874
2005	4095	1513	1400	1510	922	3185	5792
2015	4408	1628	1503	1624	985	3505	6638
2025	4640	1711	1709	1699	1024	3747	7296

IDE ASSOCIATES, INC.

TABLE 4.A.7b--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--HIGH GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ PHILADELPHIA SMSA-NJ			PARTICIPANTS											
1974	624254	587649	604329	445981	302320	261968	110276	343457	210617	100340	98041	199913	310565	286724
1985	833453	762776	787667	577670	417602	340476	143324	444198	282090	122020	127423	253298	440752	429624
1995	977459	878318	905084	670706	500579	393382	165594	510305	325164	136901	147223	291245	534659	539269
2005	1123352	997520	1027569	760209	586163	449130	189062	576863	369735	152381	168086	329625	628706	650154
2015	1264320	1115349	1147747	850342	665855	503477	211939	643642	413986	168246	188426	368821	715300	749086
2025	1389288	1219963	1254545	929067	736566	551994	232362	702609	453212	181636	206583	402748	792661	836566
			ACTIVITY DAYS											
1974	22053	5181	14276	27894	2923	3841	1750	6017	2360	1830	2629	1661	4003	6189
1985	30856	6770	18580	32248	4298	4992	2274	7820	3050	2566	3215	1981	5737	9728
1995	37238	7762	20981	37492	5342	5768	2628	9035	3521	3227	3623	2225	6980	12570
2005	43603	8706	23713	41884	6400	6586	3000	10316	4012	3870	4112	2519	8212	15557
2015	49506	9684	26416	46100	7353	7383	3363	11564	4497	4469	4615	2811	9338	18177
2025	54753	10549	28832	49511	8195	8094	3687	12678	4928	4960	5046	3055	10349	20453
NJ SALEM			PARTICIPANTS											
1974	43371	41402	42621	30619	20950	18740	7515	24109	15514	6759	7036	13585	21202	19105
1985	57041	52785	54534	39127	28491	23969	9592	30642	19691	8108	8980	17014	29758	28366
1995	68653	62219	64151	46536	35119	28367	11352	36012	23233	9261	10628	20007	37224	36858
2005	79486	70978	73178	53057	41527	32521	13015	40897	26533	10367	12185	22800	44317	45207
2015	87348	77284	79609	57834	46212	35508	14210	44426	28923	11118	13304	24818	49448	51363
2025	93443	82143	84560	61523	49839	37814	15133	47142	30767	11674	14168	26379	53469	56149
			ACTIVITY DAYS											
1974	1505	360	997	1899	196	275	119	421	168	120	180	112	260	397
1985	2082	462	1276	2172	285	351	152	537	214	164	218	132	381	620
1995	2588	541	1475	2566	366	416	180	635	252	212	250	151	479	833
2005	3066	610	1676	2882	446	477	206	728	289	259	286	172	571	1057
2015	3411	661	1819	3079	504	520	225	795	315	296	311	186	637	1226
2025	3681	700	1928	3222	550	554	240	847	336	324	331	197	689	1356
NJ SOMERSET			PARTICIPANTS											
1974	146793	134653	138073	103270	73151	61333	26650	78926	50906	22171	23070	45778	76816	73736
1985	181845	163733	168535	124752	93382	74609	32419	95707	61617	25344	28064	54105	99424	100363
1995	210597	187379	192514	143229	110107	85679	37229	109267	70581	28267	32228	61498	117883	122352
2005	234480	207179	212816	157447	124229	95242	41384	120234	78134	30575	35825	67553	133253	140361
2015	262506	231087	237189	175291	139905	106491	46272	133830	87254	33627	40056	75222	150099	159231
2025	280060	247283	253686	186648	148853	114150	49600	142995	93432	35579	42937	80152	159522	168067
			ACTIVITY DAYS											
1974	5406	1188	3207	6264	738	890	424	1411	553	440	589	367	1018	1629
1985	6930	1456	3908	6824	993	1092	515	1716	669	596	677	412	1322	2340
1995	8190	1658	4392	7873	1204	1254	592	1971	767	739	758	460	1569	2925
2005	9223	1811	4839	8511	1376	1394	658	2191	851	840	839	507	1773	3409
2015	10373	2010	5379	9317	1559	1559	736	2449	952	952	937	563	1965	3899
2025	11020	2144	5746	9804	1647	1671	789	2626	1020	990	1003	599	2121	4082
NJ SUSSEX			PARTICIPANTS											
1974	29531	27933	28555	20884	14411	12775	5704	16314	10566	4599	4807	9237	14704	13496
1985	94293	86706	88949	64865	47538	39702	17728	50482	32659	13431	14939	28146	49957	48371
1995	121721	116531	119295	84315	59117	53581	23926	67643	43936	17485	20162	36167	59640	53505
2005	157259	140244	143569	105471	82714	64769	28922	81072	52433	20655	24372	45226	88448	91285
2015	181817	160943	164549	121192	96665	74525	33278	92845	60851	23447	28043	52031	103491	108504
2025	202049	178016	181935	133601	108254	82658	36909	102434	67339	25398	31103	57181	116107	122793
			ACTIVITY DAYS											
1974	1042	246	670	1292	138	187	91	297	115	85	122	76	195	286
1985	3491	768	2086	3600	484	581	282	924	354	283	357	218	669	1076
1995	4208	1026	2748	4858	549	784	381	1247	478	336	468	283	788	1091
2005	6120	1221	3295	5736	898	948	460	1507	577	535	564	341	1188	2164
2015	7146	1393	3769	6483	1064	1091	530	1734	664	641	652	392	1388	2621
2025	7998	1535	4159	6966	1201	1210	587	1924	735	722	716	427	1556	2990
NJ UNION			PARTICIPANTS											
1974	385629	356845	367072	263911	192429	160173	67394	205015	131494	55067	59817	115579	201000	190751
1985	399500	361890	373440	266944	204938	162578	68406	207344	132809	52709	60715	114602	217873	216176
1995	417884	373083	384256	275987	218562	168334	70828	213033	137033	52330	62865	117058	234259	239157
2005	432403	382586	394213	281573	229561	173464	72986	217401	140605	52360	64780	119222	246917	256688
2015	443854	390666	402266	287228	237484	177533	74498	221534	143711	52653	66300	121518	255689	268573
2025	452661	396882	408426	291597	243528	180693	76028	224700	146087	52850	67480	123194	262553	277606
			ACTIVITY DAYS											
1974	14055	3076	8554	15169	1917	2350	1069	3698	1426	1096	1490	920	2594	4152
1985	15088	3141	8703	13826	2145	2385	1085	3754	1441	1213	1434	864	2830	4921
1995	16156	3219	8793	14225	2356	2470	1123	3887	1489	1350	1436	860	3050	5575
2005	16961	3259	8984	14220	2517	2545	1158	4005	1532	1435	1469	877	3216	6103
2015	17531	3313	9148	14213	2627	2605	1185	4099	1567	1506	1501	890	3329	6462
2025	17977	3355	9269	14253	2711	2651	1206	4172	1594	1556	1521	898	3418	6722
NJ WARREN			PARTICIPANTS											
1974	52612	50481	51538	36725	25538	22714	10365	28995	18670	7998	8498	16189	25870	23308
1985	67282	62560	64070	45621	33775	28201	12869	35799	23052	9308	10551	19717	35363	33662
1995	86214	78529	80247	57723	44328	35563	16229	44786	28969	11325	13306	24698	47114	46566
2005	108430	97281	99420	71646	56931	44217	20178	55277	35918	13796	16544	30634	60918	62106
2015	132192	117480	119936	86535	70367	53574	24448	66564	43430	16337	20044	36920	75467	78534
2025	156511	138228	141048	101716	84048	63185	28834	78149	51128	18906	23640	43295	90363	95092
			ACTIVITY DAYS											
1974	1830	437	1210	2231	239	333	165	542	203	144	214	134	343	482
1985	2444	544	1503	2474	338	414	205	673	290	190	251	153	473	731
1995	3263	679	1852	3122	462	522	258	848	315	261	308	186	632	1045
2005	4200	832	2285	3808	612	648	321	1055	391	350	382	231	817	1449
2015	5188	998	2748	4493	770	786	389	1278	473	446	461	277	1010	1873
2025	6198	1170	3228	5164	930	927	459	1507	558	540	540	322	1210	2293

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TABLE4.A.7b—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—HIGH GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY TOTAL			PARTICIPANTS											
1974	9170403	8768660	9041891	6378580	4412104	3550445	1594766	4901934	2951162	1383652	1294684	2806889	4574355	4268450
1985	9981767	9272335	9591243	6766702	4944966	3776594	1693346	5178552	3121853	1386311	1379106	2921023	5245823	5085021
1995	10898369	9914431	10231090	7303161	5518051	4072281	1825224	5528487	3355086	1432425	1488933	3116555	5923378	5918799
2005	11712192	10507181	10834449	7748693	6039868	4357663	1951173	5840770	3574809	1492608	1595253	3306031	6524572	6663731
2015	12519591	11125741	11456311	8231557	6531396	4647250	2078666	6180050	3806488	1562322	1703291	3514165	7080883	7338306
2025	13352369	11787794	12128691	8725655	7027165	4955844	2214342	6543951	4051630	1632480	1818451	3719542	7636049	7993369
			ACTIVITY DAYS											
1974	322788	76072	213175	374089	43501	52468	25260	89341	31511	26471	35550	22852	58228	91998
1985	365695	80998	226057	357171	51130	55786	26826	94652	33360	29959	35781	22491	67263	114300
1995	410927	86212	236461	383728	58842	60132	28921	101755	35947	34448	37286	23275	76273	135864
2005	450478	90318	249626	401331	65777	64322	30921	108527	38410	38216	39658	24674	84222	156407
2015	487635	95165	263234	419811	72135	68573	32947	115369	40968	41978	42239	26093	91574	174842
2025	524725	100503	278200	436664	78350	73102	35102	122649	43666	45574	44716	27419	98904	192306
NY ALBANY SMSA			PARTICIPANTS											
1974	509304	485324	496234	355482	246922	209830	97710	275713	173393	77962	77809	157471	253659	231991
1985	574167	531767	546138	389493	287009	230362	106125	301233	189196	80312	85623	169011	302859	290624
1995	631025	573342	586838	423636	322430	249276	116078	323596	204167	84089	92437	182156	344741	342146
2005	693629	621482	636307	458963	361475	271365	126364	349239	221392	89194	100627	196869	389089	396899
2015	742093	658526	673392	487493	391762	288345	134271	369196	234925	93314	106924	209058	422932	439546
2025	783542	[illegible]	705987	510672	417576	303456	141308	386284	246642	96247	112528	218500	451916	474931
			ACTIVITY DAYS											
1974	17900	4200	11740	21450	2372	3085	1554	5161	1869	1429	2055	1303	3341	4915
1985	21091	4629	12916	20994	2915	3387	1687	5639	2040	1664	2128	1318	4002	6418
1995	23889	4962	13630	22900	3395	3665	1846	6132	2205	1947	2244	1385	4586	7764
2005	26831	5319	14712	24322	3910	3990	[illegible]	6675	2397	2243	2424	1493	5178	9281
2015	29091	5605	15533	25400	4312	4240	2135	7093	2546	2504	2577	1579	5624	10497
2025	31007	5851	16264	26040	4645	4462	2247	7465	2675	2698	2691	1639	6010	11466
NY BROOME & TIOGA			PARTICIPANTS											
1974	180329	173362	177002	127424	87108	76431	35408	99523	63263	28269	28500	56568	88578	80561
1985	197292	183999	188583	135338	98415	81230	37632	105257	66828	28200	30289	58842	103085	98683
1995	215642	196952	201439	146400	109947	87212	40403	112425	71598	29346	32520	63003	116617	115839
2005	232498	209334	214098	155668	120875	93104	43133	118986	76171	30627	34717	66974	129316	131770
2015	247218	220576	225392	164486	129986	98305	45542	125156	80360	31928	36656	70789	139493	144556
2025	260756	231188	236135	172323	138261	103253	47835	130917	84269	32962	38501	74021	148774	155839
			ACTIVITY DAYS											
1974	6285	1510	4166	7914	827	1122	563	1851	684	513	745	471	1178	1699
1985	7210	1612	4434	7531	992	1192	599	1967	722	580	747	462	1379	2175
1995	8127	1720	4651	8130	1152	1280	643	2112	775	676	781	481	1566	2628
2005	8952	1807	4926	8482	1300	1367	686	2255	826	762	832	511	1733	3083
2015	9634	1895	5173	8817	1421	1443	725	2381	873	841	880	538	1868	3448
2025	10251	1979	5409	9056	1528	1516	761	2500	916	904	919	559	1992	3757
NY CHENANGO			PARTICIPANTS											
1974	31398	30935	31511	22332	15148	14579	6368	18091	11970	5026	5510	9900	14893	13184
1985	37142	35241	36027	25532	18517	16649	7271	20524	13578	5351	6292	11062	18904	17615
1995	41946	38741	39515	28503	21415	18362	8020	22514	14945	5743	6940	12245	22293	21592
2005	46570	42242	43090	31169	24292	20108	8782	24448	16313	6146	7600	13390	25565	25556
2015	51066	45752	46615	33901	27020	21841	9539	26419	17697	6571	8255	14573	28629	29227
2025	55380	49202	50097	36466	29619	23551	10286	28346	19047	6950	8901	15647	31515	32637
			ACTIVITY DAYS											
1974	1063	268	737	1443	138	213	101	332	130	89	136	84	190	271
1985	1326	307	842	1469	179	243	116	379	146	106	146	88	251	376
1995	1554	336	910	1628	216	268	128	418	163	126	157	96	298	476
2005	1771	362	988	1743	253	296	140	458	179	147	172	103	342	583
2015	1977	390	1067	1856	288	319	152	497	194	167	187	111	384	683
2025	2169	417	1146	1950	320	344	164	536	209	186	200	116	422	776
NY COLUMBIA			PARTICIPANTS											
1974	36772	36432	37120	25605	17747	16425	7408	20747	13419	5615	6134	11227	17543	15568
1985	43801	41610	42518	29474	21874	18814	8486	23589	15266	5995	7026	12645	22527	21042
1995	50954	47022	47938	33861	26093	21336	9626	26593	17472	6596	7968	14394	27422	26453
2005	57963	52427	53461	37947	30374	23878	10770	29535	19271	7223	8917	16123	32297	32505
2015	64172	57299	58352	41714	34104	26163	11801	32216	21093	7815	9770	17735	36493	37501
2025	70047	62007	63089	45182	37626	28393	12807	34779	22847	8327	10603	19175	40423	42113
			ACTIVITY DAYS											
1974	1245	311	871	1582	163	241	118	391	146	102	132	94	231	320
1985	1570	357	997	1610	214	276	135	448	166	121	163	99	299	440
1995	1899	401	1108	1834	266	313	153	508	188	150	181	109	364	586
2005	2224	442	1231	2009	321	350	171	569	210	180	202	121	429	743
2015	2505	481	1341	2171	368	384	188	624	230	209	222	133	485	878
2025	2767	518	1449	2300	412	417	204	677	249	234	239	142	538	999
NY DELAWARE			PARTICIPANTS											
1974	30276	30422	30934	21416	14455	13708	6303	17382	11247	4826	5124	9499	14133	12394
1985	36579	35442	36160	24972	17991	16022	7367	20149	13045	5232	5989	10808	18231	16676
1995	44819	42206	42959	30251	22531	19141	8801	23943	15554	6082	7154	12904	23319	22071
2005	56506	52196	53134	37611	28952	23760	10925	29498	19252	7403	8881	16160	30367	29542
2015	72050	65557	66648	47571	37508	29921	13758	36973	24217	9206	11184	20460	39687	39581
2025	87601	78789	80030	57355	46199	36057	16579	44334	29129	10997	13477	24429	49234	50000
			ACTIVITY DAYS											
1974	1010	260	725	1375	131	201	100	329	122	85	130	82	189	294
1985	1280	304	848	1423	171	235	117	384	142	101	142	87	244	390
1995	1626	361	992	1710	223	281	140	459	169	128	167	101	312	476
2005	2105	441	1222	2064	295	349	174	570	210	165	207	125	406	683
2015	2740	552	1532	2584	392	439	219	718	264	220	261	150	531	900
2025	3587	660	1837	3044	493	529	264	865	318	276	313	180	680	1157

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TABLE 4.A.7b—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—HIGH GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY DUTCHESS			PARTICIPANTS											
1974	159381	151822	155835	112316	77094	68013	29486	88047	56270	24719	25452	49673	78558	71282
1985	191204	177257	182525	131393	95400	79478	34457	102516	65433	27330	29743	57067	99922	95468
1995	230759	209196	214915	156661	118111	94130	40808	120680	77311	31249	35226	67296	125527	125180
2005	274160	245517	252236	183492	142868	111036	48138	140974	90817	35924	41552	78737	152802	155073
2015	319747	283683	291089	212253	168600	128711	55801	162463	105090	40853	48167	91023	181155	188209
2025	374233	330144	338621	246767	199211	150110	65078	188701	122367	46829	56175	105591	214118	225000
			ACTIVITY DAYS											
1974	5559	1332	3676	6783	730	997	468	1583	609	449	652	407	1022	1400
1985	6987	1566	4309	7143	959	1165	547	1850	708	559	725	442	1311	2100
1995	8727	1840	4979	8468	1243	1380	648	2191	838	734	835	505	1654	2864
2005	10571	2133	5820	9756	1538	1620	765	2585	986	902	978	592	2015	3658
2015	12496	2450	6701	11050	1849	1887	886	2996	1143	1092	1132	680	2308	4504
2025	14740	2841	7741	12597	2204	2201	1034	3494	1332	1308	1313	784	2821	5446
NY GREENE			PARTICIPANTS											
1974	24316	24308	24748	16800	11754	11036	4992	13792	8975	3649	4124	7334	11538	10170
1985	30086	28819	29417	20120	15023	13116	5933	16286	10601	4060	4901	8601	15371	14242
1995	36002	33462	34074	23763	18432	15287	6916	18860	12325	4582	5712	10067	19268	18569
2005	42631	38811	39535	27737	22319	17791	8048	21798	14304	5228	6647	11746	23622	23569
2015	49298	44245	45011	31827	26201	20335	9199	24798	16330	5894	7598	13485	27952	28522
2025	54945	48885	48684	35258	29553	22522	10188	27345	18058	6429	8415	14915	31675	32812
			ACTIVITY DAYS											
1974	818	206	580	1021	107	162	79	263	97	66	100	61	153	207
1985	1071	245	690	1083	145	192	94	313	115	82	112	67	204	300
1995	1333	284	788	1264	186	224	110	364	134	103	127	76	256	403
2005	1625	326	910	1445	233	261	128	424	156	129	140	88	314	533
2015	1916	369	1035	1625	281	298	146	485	178	156	169	100	372	661
2025	2165	407	1142	1764	321	330	162	537	197	179	187	110	422	772
NY NASSAU & SUFFOLK			PARTICIPANTS											
1974	1875942	1722687	1763337	1322990	936222	784603	339235	1008008	651269	286720	294924	589868	981678	964961
1985	2109622	1902973	1956069	1447653	1083343	867652	375142	1109626	715792	295846	326141	629901	1151358	1159697
1995	2380021	2120669	2175688	1622332	1242460	969176	419038	1234767	798403	322603	364303	699624	1328344	1374169
2005	2635433	2331124	2391208	1776396	1393127	1070462	462830	1351506	878736	348972	402375	764661	1493085	1566904
2015	2908053	2561449	2624350	1952231	1546217	1178870	509702	1482504	967071	380242	443124	844205	1658117	1752985
2025	3208153	2817901	2886330	2141085	1713621	1299555	561882	1627766	1064372	411549	488488	924386	1839548	1953472
			ACTIVITY DAYS											
1974	69131	15099	40988	82013	9460	11489	5393	18037	7069	5688	7645	4790	12970	20985
1985	80269	16799	45344	80815	11484	12706	5963	19947	7773	6888	7933	4846	15270	26972
1995	92356	18679	49674	90836	13530	14192	6661	22281	8679	8307	8678	5280	17632	32740
2005	103450	20281	54432	98415	15372	15675	7357	24609	9573	9380	9575	5820	19812	37918
2015	114722	22181	59665	106799	17169	17263	8102	27101	10544	10499	10598	6407	21983	42797
2025	127047	24323	65520	114693	19109	19030	8932	29876	11614	11621	11612	6973	24306	47888
NY NEW YORK CITY			PARTICIPANTS											
1974	5107345	4976637	5159830	3528424	2403671	1851718	844971	2706926	1545083	765169	659087	1542234	2488256	2273928
1985	5305320	5003837	5204335	3574657	2565951	1862108	851723	2715866	1546492	733468	662786	1536159	2728814	2593832
1995	5543387	5102017	5295430	3681343	2742762	1907028	872270	2758289	1577335	716496	678774	1560913	2960992	2900793
2005	5683190	5142436	5332735	3722661	2868080	1932155	883763	2766459	1590963	709366	687718	1577302	3124910	3136688
2015	5792410	5176973	5362673	3762369	2963639	1950930	892350	2777335	1603154	702593	694400	1592750	3249637	3320682
2025	5889452	5217778	5400984	3798459	3044271	1971037	901547	2792864	1616483	697886	701557	1604911	3351204	3467992
			ACTIVITY DAYS											
1974	175788	43304	122400	199928	23570	27557	13375	49502	16282	14431	19108	12538	30753	48767
1985	190293	43524	123620	181933	26320	27712	13450	49780	16294	15281	18329	11812	33985	57344
1995	205268	44117	123126	185082	29028	28380	13774	50981	16660	16572	18046	11559	37034	65228
2005	215431	43965	123722	183733	31109	28754	13956	51653	16839	17557	18184	11620	39198	72240
2015	223248	44017	124036	181722	32747	29034	14091	52155	16989	18439	18292	11616	40859	77816
2025	229623	44201	124767	179604	34070	29333	14237	52692	17144	19197	18365	11594	42187	82275
NY ORANGE			PARTICIPANTS											
1974	159945	153796	157490	113030	77073	67749	30063	88413	56071	25172	25240	50159	78268	70892
1985	200462	186454	191606	137478	99838	82239	36494	106830	67677	28723	30639	59797	104605	99938
1995	254939	231886	237826	172762	129978	102635	45545	132514	84237	34631	38238	74312	138212	136980
2005	301031	269639	276467	200848	156796	119979	53240	153332	98053	39428	44499	86292	167968	171370
2015	343393	304587	311934	227474	181084	135914	60312	172808	110924	43980	50636	97740	194733	202140
2025	376503	331840	339699	247734	200229	148392	65849	187896	120920	47235	55284	106317	215917	226552
			ACTIVITY DAYS											
1974	5954	1340	3721	6998	730	995	478	1612	605	455	661	417	1028	1493
1985	7312	1634	4526	7600	1006	1208	580	1957	731	590	759	468	1376	2203
1995	9608	2023	5511	9519	1362	1507	724	2442	911	800	920	564	1821	3110
2005	11612	2323	6388	10853	1690	1762	846	2854	1063	991	1070	654	2216	4016
2015	13425	2610	7189	12063	1985	1996	958	3233	1206	1170	1213	737	2567	4827
2025	14851	2833	7824	12867	2218	2179	1046	3530	1313	1307	1319	797	2847	5470
NY OTSEGO			PARTICIPANTS											
1974	38445	38169	38874	27361	18310	17080	7870	21904	14097	6333	6383	12328	18072	15918
1985	45270	43116	44069	31072	22320	19353	8917	24624	15850	6698	7232	13676	22923	21223
1995	52439	48447	49375	35433	26361	21862	10073	27563	17838	7273	8170	15418	27855	26836
2005	58893	53291	54318	39199	30488	24134	11120	30207	19636	7860	9019	17049	32373	32271
2015	65117	58155	59198	43024	34266	26414	12170	32887	21461	8474	9871	18718	36666	37415
2025	71067	62912	64604	46629	37816	28635	13194	35511	23229	9048	10701	20248	40660	42124
			ACTIVITY DAYS											
1974	1289	329	933	1727	163	251	125	410	153	109	170	107	240	334
1985	1604	373	1058	1737	217	284	142	465	172	128	181	111	306	459
1995	1936	416	1164	1965	269	321	160	525	[illegible]	155	199	121	372	596
2005	2237	453	1273	2120	320	356	177	580	213	182	219	133	433	741
2015	2525	491	1384	2297	368	387	196	635	233	210	239	145	491	878
2025	2792	530	1494	2444	413	420	210	688	253	236	258	156	545	1006

IBE ASSOCIATES, INC.

TABLE 4.A.7b—PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP—HIGH GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

AREA YEAR	SWIM-MING	PICNIC-KING	SS. PLEAS DRIVE	BICYC-LING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SHOWN	ICE SKAT-ING	GOLF, ... GOLF	TENNIS
NY PUTNAM			PARTICIPANTS											
1974	49118	42240	43145	32176	22180	19271	8594	24780	15999	7080	7294	14262	22946	21510
1985	66555	60091	64429	46089	33019	27826	12408	35585	22962	9542	10670	19970	35600	30347
1995	90512	81573	83496	62009	46937	37399	16677	47595	30782	12396	14077	26576	49968	51060
2005	117425	104774	107202	79532	61844	48261	21521	60834	39596	15725	18160	36140	66040	68800
2015	147946	131238	134129	99649	78538	60605	27026	76069	49673	19480	22811	47823	87966	88490
2025	186587	164452	168398	124805	99637	76324	34035	95304	62442	24052	28729	58595	106664	113082
			ACTIVITY DAYS											
1974	1626	374	1007	2040	217	282	137	448	173	136	185	116	307	462
1985	2498	543	1454	2615	352	407	198	647	249	213	251	153	480	806
1995	3480	724	1911	3501	504	547	265	869	334	311	328	199	672	1200
2005	4584	919	2450	4442	677	706	343	1122	431	417	424	258	880	1606
2015	5816	1145	3061	5483	868	887	430	1408	541	538	534	323	1127	2151
2025	7373	1432	3838	6708	1107	1117	542	1776	681	682	669	401	1431	2766
NY ROCKLAND & WESTCHESTER			PARTICIPANTS											
1974	811012	744177	764097	559573	407193	329167	142655	427679	271733	117631	122605	245900	420302	417211
1985	932426	839280	864498	628268	480654	371396	160956	481097	305154	125073	130626	270422	513770	520505
1995	1068330	949686	976911	712090	559963	421810	182805	542743	345670	136396	157214	302790	602135	624523
2005	1201930	1060613	1090931	790832	638012	473591	205246	603122	386196	148966	176513	335916	687557	722771
2015	1350357	1186028	1218706	885176	720784	530598	229952	673392	432652	165125	197760	376732	778016	823505
2025	1510112	1322756	1359074	985299	809022	592540	256797	749955	482425	181488	220047	418751	874243	929003
			ACTIVITY DAYS											
1974	30041	6466	17808	32754	4171	4833	2265	7740	2940	2464	3130	1954	5603	9368
1985	35631	7350	20134	33176	5148	5453	2555	8733	3301	3040	3346	2039	6729	12165
1995	41616	8279	22341	37332	6140	6193	2902	9918	3744	3668	3670	2225	7895	14066
2005	47347	9126	24858	40815	7080	6953	3258	11135	4195	4198	4105	2470	9010	17647
2015	53502	10160	27707	45135	8053	7790	3650	12476	4702	4769	4620	2776	10195	20031
2025	60037	11306	30828	49281	9074	8699	4077	13932	5249	5350	5134	3066	11457	22677
NY SCHOHARIE			PARTICIPANTS											
1974	19394	19530	19814	13925	9259	8906	4041	11250	7334	3220	3339	6269	9001	7918
1985	24702	23879	24308	17091	12187	10925	4957	13686	8928	3676	4096	7509	12345	11305
1995	29761	27914	28359	20288	15048	12820	5818	15953	10447	4171	4807	8824	15507	14929
2005	34840	31996	32511	23395	18009	14751	6694	18218	11985	4702	5531	10173	18907	18720
2015	38593	36090	36625	26001	19648	16680	7569	20507	13540	5250	6254	11350	20308	19575
2025	44083	39456	40009	29092	23424	18292	8301	22361	14813	5644	6859	12630	24953	25690
			ACTIVITY DAYS											
1974	647	167	468	921	84	131	64	211	80	96	87	55	121	164
1985	869	205	574	1004	117	160	79	250	97	70	100	61	166	263
1995	1089	239	659	1177	150	188	93	303	114	88	115	70	209	326
2005	1312	271	752	1329	186	216	107	349	131	107	132	80	254	424
2015	1419	304	846	1483	196	244	120	395	140	110	149	90	273	429
2025	1719	331	923	1586	253	268	132	433	162	145	163	90	335	606
NY SULLIVAN			PARTICIPANTS											
1974	37932	38061	36925	26516	18141	16934	7504	21639	13662	5856	6305	11655	17867	15723
1985	49825	48334	49581	33790	24475	21543	9547	27381	17531	6985	8022	14528	24848	22793
1995	61812	58345	59727	41254	31081	26130	11580	32924	21186	8112	9730	17536	32176	30536
2005	77068	71453	73167	50625	39473	32142	14244	40161	25950	9683	11968	21443	41370	40249
2015	93081	85142	87105	60681	48304	38390	17012	47733	30966	11420	14295	25770	51032	50641
2025	108858	98464	100661	70307	57204	44528	19733	55056	35835	12957	16580	29784	60867	61421
			ACTIVITY DAYS											
1974	1271	326	914	1622	166	249	119	403	150	104	150	98	234	322
1985	1742	416	1164	1844	234	316	152	513	190	136	190	115	326	480
1995	2239	498	1379	2211	308	384	186	622	230	174	223	134	422	658
2005	2861	604	1679	2696	402	472	226	765	282	222	270	162	543	888
2015	3516	715	1996	3114	503	564	270	914	337	276	325	196	671	1143
2025	4178	823	2304	3511	606	654	313	1060	390	331	374	221	801	1409
NY ULSTER			PARTICIPANTS											
1974	103454	100758	102995	73210	49867	44995	20158	58040	37157	16397	16814	32532	90083	45267
1985	137226	129436	132780	94252	68150	57881	25931	74305	47520	19820	21629	41017	70572	66003
1995	166021	152975	156598	112575	84322	68677	30768	87560	56218	22660	25663	48448	88745	86907
2005	198465	179846	184029	132618	102884	81146	36355	102473	66174	26161	30323	57056	109304	110059
2015	234997	210441	215092	155707	123535	95230	42664	119614	77535	30168	35586	66954	131996	135571
2025	271000	240722	245849	170222	143894	109199	48923	136532	88752	33900	40806	76482	154330	160597
			ACTIVITY DAYS											
1974	3561	877	2440	4520	469	660	321	1067	402	297	435	273	661	957
1985	4943	1133	3145	5195	677	849	412	1373	514	401	529	323	935	1464
1995	6179	1332	3639	6168	868	1007	489	1629	609	509	609	371	1178	1951
2005	7566	1547	4263	7136	1090	1190	578	1925	719	633	718	436	1452	2545
2015	9106	1800	4970	8211	1335	1397	678	2259	843	779	841	507	1794	3201
2025	10619	2051	5673	9200	1576	1602	778	2590	966	919	959	574	2051	3841
CT TOTAL			PARTICIPANTS											
1974	1191230	1111564	1140420	828572	588876	496699	216700	841168	489954	178520	185616	366133	611639	576015
1985	1386569	1264548	1301649	939945	705645	565656	246859	727041	464337	191446	211377	407108	747813	737534
1995	1576318	1415345	1453883	1056113	818592	635930	277580	811044	520206	206827	237641	451984	879580	889761
2005	1766857	1570272	1613330	1167667	932482	708958	309523	895708	577623	224527	264938	499005	1001482	1038749
2015	1954693	1726322	1771587	1284824	1040520	781378	341182	982784	635984	244069	292005	549387	1118969	1174381
2025	2136527	1878832	1926922	1394516	1145112	852812	372395	1067002	692600	260919	318703	594733	1233419	1383794
			ACTIVITY DAYS											
1974	43000	9666	26790	49339	5814	7286	3442	11637	4439	3646	4754	2971	7999	12528
1985	51999	11065	30581	50374	7340	8298	3922	13256	5028	4250	5128	3129	9841	16706
1995	60611	12314	33539	56424	8783	9329	4410	14903	5643	5143	5500	3384	11549	20724
2005	69036	13497	37065	61285	10201	10400	4917	16615	6281	5958	6182	3742	13212	24741
2015	77001	14761	40591	66548	11503	11463	5420	18313	6923	6767	6828	4111	14750	28349
2025	84697	15998	44087	70748	12746	12510	5916	19987	7545	7478	7287	4417	16259	31678

IDE ASSOCIATES, INC.

TABLE 4.A.76--PARTICIPATION IN 14 RECREATION ACTIVITIES, DEMOGRAPHIC PROJECTIONS TO 2,025, TOCKS ISLAND LAKE RECREATION SERVICE AREA, BY COUNTY GROUP--HIGH GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

	SWIM -MING	PICNIC -KING	SS. PLEAS DRIVE	BICYC -LING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
[illegible]FIELD			PARTICIPANTS											
[illegible]	560187	517125	530646	348528	279033	232633	100440	299144	191979	82700	87070	171335	292799	281047
[illegible]	638169	569766	586670	426302	323769	256532	110758	328638	210611	85775	96015	184118	344406	345383
[illegible]	700404	631041	649380	474218	370603	285595	123306	363369	233741	92027	106893	202470	397105	408879
[illegible]	785355	694649	714087	518076	416656	315580	136221	397632	257186	99010	118089	221327	447762	468713
[illegible]	863720	760280	780757	567976	461259	346101	149430	434409	281869	107231	129539	242507	496166	523803
[illegible]	941691	826144	847752	615501	505658	377132	162828	470927	306529	114708	141153	262407	544591	577809
			ACTIVITY DAYS											
[illegible]	20539	4499	12390	23065	2819	3411	1595	5403	2081	1672	2210	1377	3838	6227
[illegible]	23920	4992	13684	22798	3423	3761	1759	5958	2284	2006	2306	1402	4531	7987
[illegible]	27477	5509	14888	25306	4025	4188	1959	6633	2539	2392	2490	1505	5233	9659
[illegible]	30864	5981	16310	27221	4595	4626	2164	7328	2800	2716	2736	1650	5899	11272
2015	34140	6515	17795	29403	5125	5075	2374	8039	3071	3038	3009	1806	6532	12718
2025	37412	7048	19300	31303	5645	5530	2586	8760	3343	3330	3259	1943	7170	14090
CT LITCHFIELD			PARTICIPANTS											
1974	102619	96583	98632	71103	50697	44172	19073	55754	36250	15221	16585	31272	52133	48198
1985	123747	113404	116162	83421	63197	51963	23378	65229	42397	16803	19511	35964	66679	65102
1995	148261	133600	136574	98740	77617	61485	27661	76595	49995	19134	23085	42078	82575	83461
2005	176493	157121	160655	115904	93928	72630	32676	89690	58843	22043	27270	49302	100618	104464
2015	201551	178344	182210	131352	108286	82674	37194	101551	66860	24501	31041	55771	116084	122058
2025	223845	197220	201349	144917	121057	91668	41241	112038	73998	26712	34418	61429	129975	137642
			ACTIVITY DAYS											
1974	3666	836	2311	4250	488	647	316	1037	394	205	410	254	693	1019
1985	4631	986	2721	4475	648	761	372	1220	461	365	456	276	896	1451
1995	5706	1156	3146	5274	824	901	440	1444	544	472	523	314	1109	1920
2005	6924	1343	3645	6087	1025	1064	520	1706	642	593	615	369	1350	2400
2015	7971	1516	4169	6757	1194	1211	592	1941	730	697	697	415	1556	2940
2025	8907	1670	4600	7291	1344	1343	656	2153	809	783	768	454	1741	3339
CT NEW HAVEN			PARTICIPANTS											
1974	528424	497856	511142	368961	258246	219894	96387	286250	181725	80599	81961	163526	266707	246770
1985	632653	561378	598817	430222	318679	257161	112723	333174	211329	88868	95851	187026	336728	327049
1995	719653	649904	667921	483155	370572	288850	126613	371080	236470	95666	107663	207436	395900	397401
2005	805009	718502	738548	532887	421898	320820	140626	408386	261594	103474	119579	228376	453102	465572
2015	884422	787690	808620	585496	470975	352603	154558	446824	287255	112257	131425	251109	506719	528520
2025	970991	855468	877821	634098	518397	384012	168326	484037	312073	119499	143132	270897	558853	588343
			ACTIVITY DAYS											
1974	18795	4331	12090	22024	2507	3228	1531	5196	1964	1489	2134	1340	3472	5282
1985	23449	5087	14174	23101	3269	3775	1790	6077	2284	1878	2365	1451	4416	7328
1995	27428	5650	15504	25845	3935	4241	2011	6826	2561	2279	2566	1565	5207	9145
2005	31249	6173	17070	27977	4581	4710	2233	7581	2839	2649	2831	1723	5962	10989
2015	34881	6730	18627	30388	5184	5177	2455	8332	3121	3032	3121	1890	6662	12690
2025	38378	7281	20186	32154	5757	5638	2673	9075	3393	3364	3360	2020	7347	14249
DE TOTAL			PARTICIPANTS											
1974	281038	264664	272548	201324	135701	117280	48548	154707	97964	45517	43832	90443	139219	128396
1985	337698	310145	320744	235194	167973	137529	56930	180717	114211	50086	51400	103468	176838	170947
1995	393738	355317	366608	271221	200061	158235	65501	206419	131000	55652	59139	118076	213236	212936
2005	449856	400924	413547	305705	232950	179458	74286	231868	147989	61704	67071	133008	249698	255741
2015	501764	443612	457066	338771	262803	199070	82404	256034	163990	67501	74401	147435	282166	293866
2025	544969	479399	494124	364269	288000	215686	89282	275951	177130	71141	80611	157528	309860	326023
			ACTIVITY DAYS											
1974	9899	2335	6444	12637	1310	1720	770	2683	1058	828	1190	793	1777	2777
1985	12407	2757	7575	13207	1715	2017	903	3146	1233	1026	1316	813	2282	3844
1995	14882	3141	8493	15252	2115	2321	1038	3620	1417	1269	1471	905	2764	4908
2005	17342	3501	9548	16952	2523	2633	1178	4105	1605	1511	1661	1020	3240	6058
2015	19553	3853	10526	18496	2889	2920	1306	4554	1780	1751	1847	1128	3658	7097
2025	21408	4153	11364	19262	3197	3164	1416	4934	1924	1934	1965	1190	4018	7947
DE NEW CASTLE			PARTICIPANTS											
1974	281038	264664	272548	201324	135701	117280	48548	154707	97964	45517	43832	90443	139219	128396
1985	337698	310145	320744	235194	167973	137529	56930	180717	114211	50086	51400	103468	176838	170947
1995	393738	355317	366608	271221	200061	158235	65501	206419	131000	55652	59139	118076	213236	212936
2005	449856	400924	413547	305705	232950	179458	74286	231868	147989	61704	67071	133008	249698	255741
2015	501764	443612	457066	338771	262803	199070	82404	256034	163990	67501	74401	147435	282166	293866
2025	544969	479399	494124	364269	288000	215686	89282	275951	177130	71141	80611	157528	309860	326023
			ACTIVITY DAYS											
1974	9899	2335	6444	12637	1310	1720	770	2683	1058	828	1190	793	1777	2777
1985	12407	2757	7575	13207	1715	2017	903	3146	1233	1026	1316	813	2282	3844
1995	14882	3141	8493	15252	2115	2321	1038	3620	1417	1269	1471	905	2764	4908
2005	17342	3501	9548	16952	2523	2633	1178	4105	1605	1511	1661	1020	3240	6058
2015	19553	3853	10526	18496	2889	2920	1306	4554	1780	1751	1847	1128	3658	7097
2025	21408	4153	11364	19262	3197	3164	1416	4934	1924	1934	1965	1190	4018	7947

TABLE 4.A.8—COUNTY GROUP SUPPLY-ACCESSIBILITY INDEXES—RATIO OF SUPPLY FRACTION TO POPULATION FRACTION BY 30 MINUTE TIME DISTANCE INTERVALS, 7 ACTIVITIES, TOCKS ISLAND LAKE RECREATION SERVICE AREA, 1976

COUNTY GROUP	MINUTES	SWIMMING	PICNIC	BOATING	FISHING	HUNTING	HIKING	CAMPING
PA BERKS	30	0.5001	4.8375	0.9714	0.9714	1.6735	1.1541	2.0197
	60	0.7425	1.5235	2.4206	2.4206	1.7598	0.9215	1.3956
	90	0.5522	2.4932	1.0492	1.0492	1.0894	1.0497	1.0839
	120	0.6469	2.1895	1.1994	1.1994	1.3717	1.0251	0.9938
	150	0.9071	2.1209	1.5113	1.5113	1.5317	1.5720	1.0761
PA BRADFORD	30	0.7079	4.7527	2.4775	2.4775	27.4039	2.7303	3.1921
	60	5.5091	3.1996	8.7471	8.7471	14.6015	14.1181	5.3020
	90	2.1517	2.9695	3.6171	3.6171	4.9896	5.8874	2.4698
	120	2.4625	3.4764	6.9911	6.9911	5.1294	7.3895	3.7150
	150	3.0075	4.1029	6.6888	6.6888	7.7517	8.5685	6.3223
PA BUCKS	30	1.2264	2.0367	1.0693	1.0693	0.0524	0.8213	0.2949
	60	0.5905	1.0494	0.3609	0.3609	0.5802	0.3576	0.2880
	90	0.8427	1.0965	0.8059	0.8059	0.7827	0.4824	0.4267
	120	0.7370	1.2007	1.0466	1.0466	0.9153	0.4731	0.5593
	150	0.7942	1.5098	1.1184	1.1184	1.0437	0.6945	0.7519
PA CARBON	30	0.8259	4.9827	0.9965	0.9965	2.2629	2.0426	1.2718
	60	0.9361	3.9633	1.4772	1.4772	2.1929	1.5686	1.0117
	90	1.3924	3.1170	2.1532	2.1532	1.3050	2.3873	1.0726
	120	1.0809	2.2233	2.4183	2.4183	1.8574	2.0078	1.0867
	150	0.9666	2.0540	1.9720	1.9720	1.8611	1.8047	1.5890
PA CENTRE	30	1.0276	7.4499	4.7382	4.7382	18.6104	6.5365	6.3652
	60	0.9119	9.4117	3.2003	3.2003	13.8681	12.8358	5.9189
	90	0.8866	7.2946	0.8193	0.8193	5.4937	7.3361	5.0943
	120	0.8420	6.4930	0.7300	0.7300	4.8185	6.3073	4.6328
	150	1.3049	5.6947	2.9796	2.9796	5.2980	4.6596	3.6392
PA CHESTER	30	0.9198	2.1857	0.9134	0.9134	0.0609	0.7435	0.5352
	60	0.4344	1.5604	1.2189	1.2189	0.6295	0.5144	0.5784
	90	0.5272	1.8323	1.0569	1.0569	1.0351	0.7522	0.7081
	120	0.6494	2.0479	0.9796	0.9796	1.2353	0.8564	0.9401
	150	0.9381	1.9724	1.3302	1.3302	1.2671	0.8772	0.9193
PA CLINTON	30	0.8859	5.4886	0.4815	0.4815	3.1583	14.7710	3.1198
	60	0.9583	7.0895	2.0300	2.0300	8.6249	11.3247	4.0122
	90	2.0465	5.8348	1.6831	1.6831	9.3310	10.4530	4.2934
	120	2.0465	5.8348	1.6831	1.6831	9.3310	10.4530	4.2934
	150	1.6004	5.6003	1.6342	1.6342	5.5251	7.5862	3.6382
PA COLUMBIA	30	0.6535	3.0998	0.3519	0.3519	1.9604	1.9437	2.8685
	60	1.9034	3.4465	1.4374	1.4374	2.9722	3.5562	1.8016
	90	1.5818	4.5347	1.6192	1.6192	4.4106	6.1912	2.1340
	120	1.5184	4.8491	4.1776	4.1776	4.8307	4.5852	2.7469
	150	1.5452	3.9718	3.5381	3.5381	3.3896	3.5740	2.3851
PA HARRISBURG SMSA	30	0.9223	6.0903	0.1869	0.1869	2.4636	3.4565	3.6309
	60	0.7417	5.9486	3.7958	3.7958	4.2877	2.6009	3.6722
	90	0.7621	5.4589	2.8554	2.8554	4.1463	2.9736	3.2909
	120	0.7992	4.2489	1.8285	1.8285	2.4018	2.2353	2.2030
	150	0.6987	2.6982	1.1476	1.1476	1.5889	1.6701	1.2289
PA LACKAWANNA	30	0.8356	2.6817	1.6372	1.6372	0.0146	6.8791	0.6316
	60	2.5578	3.7092	9.2192	9.2192	5.9403	9.4862	1.9522
	90	3.2170	3.7370	8.2105	4.2105	6.1832	6.6101	3.3911
	120	2.3809	2.9990	3.2563	5.2563	5.3542	5.0173	5.1862
	150	1.4232	2.0394	2.5119	2.5119	2.4819	2.6731	2.5783
PA LANCASTER	30	0.4471	5.7176	9.6806	9.6806	7.2621	1.2058	3.7395
	60	0.6708	5.1781	2.7627	2.7627	3.1150	2.0241	3.0201
	90	0.4663	2.3536	0.5964	0.9964	1.0015	0.9110	1.0046
	120	0.5590	2.2625	1.0084	1.0084	1.2140	0.9560	1.0968
	150	0.6566	2.2911	1.2515	1.2515	1.4933	1.1117	1.0832
PA LEBANON	30	0.4471	5.7176	9.6806	9.6806	7.2621	1.2058	3.7395
	60	0.7381	5.2083	2.8235	2.8235	3.3603	2.1783	3.0941
	90	0.7839	4.1694	1.7907	1.7907	1.9438	1.8577	2.0371
	120	0.5372	2.5598	1.0852	1.0852	1.0479	1.1688	1.0852
	150	0.7898	2.4335	1.2674	1.2674	1.6735	1.3263	1.1404
PA LEHIGH & NORTHAMPTON	30	0.8259	4.9827	0.9965	0.9965	2.2629	2.0426	1.2718
	60	1.3179	2.9589	1.6477	1.6477	1.7229	1.5301	0.8936
	90	0.7753	1.7383	1.6998	1.6998	1.1680	0.8305	0.7587
	120	0.60[illegible]6	0.9952	0.9092	0.9092	0.6203	0.7462	0.5029
	150	0.6739	1.0513	1.0351	1.0351	0.8281	0.8574	0.8031
PA LUZERNE	30	0.8356	2.6817	1.6372	1.6372	0.0146	6.8791	0.6316
	60	2.3470	4.1993	2.3063	2.3063	4.0857	6.6792	1.6974
	90	2.3865	3.9804	5.3931	5.3931	5.2939	5.5007	1.8537
	120	1.9701	3.3626	3.7487	3.7487	3.3023	3.7495	3.1904
	150	1.1139	2.4764	2.3560	2.3560	2.5796	2.5483	2.5633
PA LYCOMING	30	0.8859	5.4886	0.4815	0.4815	3.1583	14.7710	3.1198
	60	2.1209	4.7445	0.5067	0.5067	3.7041	6.4486	1.7450
	90	1.7162	4.7352	0.9827	0.9827	6.3268	5.4970	2.5177
	120	1.3582	4.7971	1.0529	1.0529	4.0568	5.7468	2.7690
	150	1.5749	4.6635	3.4213	3.4213	4.4077	5.0992	2.7[illegible]07
PA MONROE	30	10.2197	4.6336	21.2304	21.2304	13.7876	5.0372	7.8707
	60	1.7533	3.0875	5.7167	5.7167	2.2706	2.6242	1.5683
	90	1.0151	1.3524	2.1546	2.1546	1.0956	1.7830	1.4491
	120	0.7407	0.8105	0.8796	0.8796	0.5665	0.8141	0.6597
	150	0.7404	0.9212	1.0561	1.0561	1.0629	0.9189	0.9440
PA MONTGOMERY	30	0.4963	0.9185	0.3774	0.3774	0.3997	0.3793	0.3101
	60	0.5058	1.3500	0.4196	0.4196	0.5361	0.4617	0.4267
	90	0.8349	1.4296	0.9605	0.9605	1.1857	0.5329	0.6404
	120	0.7500	1.5172	1.0452	1.0452	1.0836	0.6547	0.7102
	150	0.7823	1.5240	1.1264	1.1264	1.0612	0.6644	0.7530
PA MONTOUR	30	0.7167	[illegible]871	0.3870	0.3870	1.9781	3.1391	3.6121
	60	2.8727	4.3886	0.9708	0.9708	4.5135	6.0104	3.0714
	90	1.6208	5.9324	1.3123	1.3123	3.8861	7.5348	3.3867
	120	1.3788	5.3507	2.9210	2.9210	5.9819	4.9836	3.1717
	150	1.4807	4.5225	3.6105	3.6105	4.0661	4.1048	2.4865

IDE ASSOCIATES, INC.

TABLE 4.A.8--COUNTY GROUP SUPPLY-ACCESSIBILITY INDEXES--RATIO OF SUPPLY FRACTION TO POPULATION FRACTION
BY 30 MINUTE TIME DISTANCE INTERVALS, 7 ACTIVITIES, TOCKS ISLAND LAKE RECREATION SERVICE AREA, 1974

COUNTY GROUP	MINUTES	SWIMMING	PICNIC	BOATING	FISHING	HUNTING	HIKING	CAMPING
PA NORTHUMBERLAND	30	0.9168	3.2743	0.7596	0.7596	1.0216	1.6590	2.1480
	60	0.9218	4.5677	0.7104	0.7104	2.4717	3.9806	2.6303
	90	1.2676	5.3282	1.1149	1.1149	3.5403	4.3233	3.0311
	120	1.1607	5.1056	2.5841	2.5841	4.4419	4.8952	2.9050
	150	0.9274	2.9084	1.9282	1.9282	2.2562	2.5232	1.3840
PA PHILADELPHIA & DELAWARE	30	0.3851	0.6715	0.2857	0.2857	0.4741	0.3022	0.1914
	60	0.4569	0.9171	0.4014	0.4014	0.4194	0.3938	0.3003
	90	0.8250	1.2630	0.9115	0.9115	1.0113	0.4126	0.5680
	120	0.7306	1.1742	1.0576	1.0576	0.9248	0.4597	0.5281
	150	0.6016	0.9700	0.7398	0.7398	0.6928	0.4632	0.4801
PA PIKE	30	12.8792	7.9171	22.1344	22.1344	23.8070	0.6976	13.5761
	60	2.0697	1.6845	6.7252	6.7252	2.6079	3.1903	4.3516
	90	1.1354	1.5925	2.6550	2.6550	1.4318	1.4960	1.8522
	120	0.6362	0.6505	0.9236	0.9236	0.9410	0.9756	0.9543
	150	0.7757	0.8001	0.9697	0.9697	0.8142	0.9378	0.8645
PA SCHUYLKILL	30	1.0012	2.9924	0.7425	0.7425	1.2825	1.5299	1.5637
	60	0.6318	4.1065	1.4921	1.4921	2.1470	1.8773	1.8799
	90	0.6950	4.5301	2.0445	2.0445	2.2964	1.8147	2.2762
	120	0.8693	2.6063	1.7575	1.7575	1.3786	2.1874	1.1013
	150	1.0184	2.7410	2.0540	2.0540	2.3606	2.4191	1.4519
PA SNYDER	30	1.1131	9.3401	0.7743	0.7743	2.8069	10.4383	5.4202
	60	0.8552	4.3515	0.4024	0.4024	1.7272	7.1267	3.3957
	90	0.8898	6.0351	0.7755	0.7755	4.3523	5.3465	4.0093
	120	1.4333	5.8234	1.0987	1.0987	4.6523	5.0786	3.4120
	150	1.1607	5.1056	2.5841	2.5841	4.4419	4.8952	2.9050
PA SULLIVAN	30	167.0043	31.6221	28.1634	28.1634	291.0223	136.8645	29.6457
	60	2.5437	3.2860	2.0756	2.0756	5.5223	10.1322	2.3406
	90	2.0152	3.9668	1.5895	1.5895	6.0622	7.6434	2.1894
	120	1.9283	3.9319	5.1318	5.1318	4.6621	7.7078	2.8090
	150	1.7961	4.9559	4.3587	4.3587	5.4843	6.0611	3.3269
PA SUSQUEHANNA	30	11.2654	7.8189	8.9506	8.9506	39.0944	70.8330	10.3395
	60	2.1758	3.0116	10.1613	10.1613	5.9687	10.3203	3.4749
	90	2.6412	3.2225	7.1121	7.1121	6.2040	7.5487	3.5092
	120	3.5209	3.9786	9.0859	9.0859	9.7984	9.0197	9.8046
	150	2.5505	3.3726	5.0025	5.0025	5.7096	5.8300	6.2088
PA UNION	30	0.9342	8.2960	1.0837	1.0837	2.2795	15.5831	4.4096
	60	0.8607	5.5229	1.3628	1.3628	5.9233	8.9238	3.9867
	90	1.7213	6.1631	0.9126	0.9126	5.7872	6.0048	4.1376
	120	1.3892	5.4243	1.4727	1.4727	5.0055	6.3515	3.3270
	150	1.2987	5.1369	3.7381	3.7381	4.7240	5.5408	2.9850
PA WAYNE	30	5.1152	4.0383	100.3302	100.3302	0.0000	62.6391	12.0253
	60	5.1327	5.2375	15.3719	15.3719	12.8187	17.5847	13.7287
	90	3.1977	3.0503	9.8704	9.8704	5.2287	7.3822	7.1673
	120	2.1231	2.6174	4.9179	4.9179	4.6680	4.4356	4.5724
	150	1.2699	1.6779	2.3535	2.3535	2.3472	2.5031	2.5481
PA WYOMING	30	1.2875	3.0449	1.9106	1.9106	3.4822	6.6344	1.1134
	60	2.7468	3.4554	6.5326	6.5326	7.5279	9.8607	2.0382
	90	2.5086	3.8165	6.9516	6.9516	6.5123	7.4758	2.8580
	120	2.5259	3.8345	5.6591	5.6591	4.9579	5.6083	4.8041
	150	2.1227	3.3856	4.5591	4.5591	4.8162	5.3896	5.1016
PA YORK	30	0.9223	6.0903	0.1869	0.1869	2.4636	3.4565	3.6309
	60	0.7417	5.9486	3.7958	3.7958	4.2877	2.6009	3.6722
	90	0.6708	5.1781	2.7627	2.7627	3.1150	2.0241	3.0201
	120	0.7054	3.6822	1.8873	1.8873	1.9335	1.7583	1.9056
	150	0.5766	2.4082	1.0457	1.0457	1.4536	1.2898	1.1938
NJ BERGEN	30	0.2633	0.1632	0.1024	0.1024	0.0011	0.1032	0.0247
	60	0.3157	0.2225	0.2811	0.2811	0.1210	0.1739	0.0446
	90	0.8943	0.3137	0.4780	0.4780	0.2642	0.2858	0.1620
	120	0.9376	0.4769	0.5277	0.5277	0.4892	0.3648	0.5317
	150	0.8766	0.5157	0.6350	0.6350	0.4262	0.4616	0.4924
NJ ESSEX	30	0.2503	0.1562	0.0973	0.0973	0.0011	0.0997	0.0237
	60	0.4680	0.1900	0.2764	0.2764	0.1327	0.1316	0.0419
	90	0.8980	0.3035	0.4697	0.4697	0.3311	0.2576	0.1771
	120	0.8200	0.4940	0.4509	0.4509	0.3602	0.3092	0.2192
	150	0.8615	0.4976	0.6812	0.6812	0.4155	0.4425	0.4653
NJ HUDSON	30	0.2544	0.1511	0.0281	0.0281	0.0008	0.0885	0.0214
	60	0.4680	0.1900	0.2764	0.2764	0.1327	0.1316	0.0419
	90	0.8346	0.2712	0.3337	0.3337	0.1407	0.2196	0.1339
	120	0.8219	0.4849	0.4491	0.4491	0.3543	0.3078	0.2018
	150	0.8213	0.4994	0.4598	0.4598	0.3673	0.3173	0.2254
NJ HUNTERDON	30	2.3931	0.4819	4.8443	4.8443	3.1741	0.3490	0.3241
	60	0.9865	1.2268	1.5098	1.5098	1.0273	0.4714	0.2506
	90	0.5957	0.5601	0.5365	0.5365	0.4145	0.3038	0.2182
	120	0.6087	0.7029	0.7045	0.7045	0.4395	0.4601	0.3044
	150	0.8199	0.7935	0.8160	0.8160	0.6002	0.6303	0.3798
NJ MERCER	30	0.7576	0.2798	0.5385	0.5385	1.2380	0.0660	0.0106
	60	0.8229	0.6712	0.3274	0.3274	0.6186	0.2759	0.2325
	90	0.7448	0.8082	0.6741	0.6741	0.6139	0.3302	0.2716
	120	0.5912	0.5844	0.5183	0.5183	0.4422	0.2849	0.2593
	150	0.5812	0.7621	0.8831	0.8831	0.5521	0.4450	0.3526
NJ MIDDLESEX	30	1.4119	0.1954	0.3289	0.3289	0.7706	0.1142	0.0977
	60	0.5349	0.2609	0.3100	0.3100	0.2319	0.1590	0.0940
	90	0.5724	0.4651	0.3971	0.3971	0.3777	0.2274	0.1936
	120	0.8112	0.5212	0.4512	0.4512	0.3600	0.3009	0.2186
	150	0.8028	0.6366	0.4812	0.4812	0.4006	0.3610	0.2601
NJ MONMOUTH	30	2.4921	0.1701	0.4330	0.4330	1.1754	0.1480	0.4905
	60	0.9349	0.1319	0.2265	0.2265	0.7351	0.0732	0.2128
	90	0.7483	0.5823	0.6141	0.6141	0.5231	0.2590	0.2102
	120	0.9748	0.4718	0.4082	0.4082	0.3863	0.2377	0.2014
	150	0.5827	0.5267	0.4981	0.4981	0.3989	0.2973	0.2311

IDE ASSOCIATES, INC.

TABLE 4.A.8 --COUNTY GROUP SUPPLY-ACCESSIBILITY INDEXES--RATIO OF SUPPLY FRACTION TO POPULATION FRACTION BY 30 MINUTE TIME DISTANCE INTERVALS, 7 ACTIVITIES, TOCKS ISLAND LAKE RECREATION SERVICE AREA, 1974

COUNTY GROUP	MINUTES	SWIMMING	PICNIC	BOATING	FISHING	HUNTING	HIKING	CAMPING
NJ MORRIS	30	0.2520	0.3936	1.7491	1.7491	0.8074	0.3697	0.0699
	60	0.4718	0.2563	0.5842	0.5842	0.3228	0.2916	0.1511
	90	0.6239	0.4431	0.5438	0.5438	0.3171	0.2778	0.1868
	120	0.8282	0.5590	0.6141	0.6141	0.3881	0.4282	0.2358
	150	0.8545	0.6261	0.6435	0.6435	0.4244	0.6249	0.3239
NJ OCEAN	30	3.5871	0.1678	0.3595	0.3595	1.9653	0.2557	0.8828
	60	2.0606	0.1873	0.4228	0.4228	1.0918	0.1320	0.4014
	90	0.7548	0.5496	0.3239	0.3239	0.6179	0.2432	0.2242
	120	0.6986	0.5761	0.6624	0.6624	0.4949	0.2853	0.2121
	150	0.5634	0.4722	0.4035	0.4035	0.3781	0.2406	0.1984
NJ PASSAIC	30	0.3445	0.6111	1.0381	1.0381	0.1051	0.2824	0.0599
	60	0.4467	0.2565	0.5426	0.5426	0.2007	0.2574	0.1540
	90	0.4832	0.2865	0.5659	0.5659	0.3022	0.2747	0.1657
	120	0.9705	0.4655	0.7641	0.7641	0.4032	0.4754	0.5323
	150	0.8702	0.5524	0.7063	0.7063	0.4077	0.4675	0.4839
NJ PHILADELPHIA SMSA-NJ	30	0.3851	0.6715	0.2857	0.2857	0.4741	0.3022	0.1914
	60	0.4505	0.7987	0.3919	0.3919	0.4430	0.3787	0.2327
	90	0.8741	0.7622	0.4176	0.4176	0.7066	0.3492	0.3636
	120	0.7002	1.0216	0.9447	0.9447	0.7382	0.3429	0.4232
	150	0.7544	1.2046	1.0119	1.0119	0.9506	0.5337	0.5638
NJ SALEM	30	0.2042	0.7531	0.6574	0.6574	0.3957	0.7659	0.3893
	60	0.3660	0.6802	0.3249	0.3249	0.4658	0.3512	0.2123
	90	0.4569	0.9171	0.4014	0.4014	0.4194	0.3938	0.3003
	120	0.8018	1.2704	0.9182	0.9182	1.0087	0.4066	0.5595
	150	0.7465	1.3442	0.9865	0.9865	1.0043	0.5900	0.5845
NJ SOMERSET	30	0.6320	0.3409	1.1628	1.1628	0.8191	0.2522	0.0942
	60	0.8776	0.7508	0.8492	0.8492	0.3651	0.2787	0.1734
	90	0.6028	0.4794	0.5064	0.5064	0.4298	0.2524	0.2072
	120	0.5969	0.5951	0.5341	0.5341	0.4754	0.3403	0.2644
	150	0.8050	0.6528	0.6400	0.6400	0.3964	0.4513	0.2702
NJ SUSSEX	30	10.2197	4.6336	21.2304	21.2304	13.7876	5.0372	7.8787
	60	2.1047	1.2912	6.2827	6.2827	2.6849	1.3993	1.4932
	90	0.8215	0.9601	1.8315	1.8315	0.7526	0.8134	0.6546
	120	0.7154	0.6109	0.8690	0.8690	0.4474	0.7964	0.5998
	150	0.7075	0.7377	0.7876	0.7876	0.6965	0.7422	0.6422
NJ UNION	30	0.3531	0.2093	0.7338	0.7338	0.4434	0.1374	0.0737
	60	0.4795	0.1933	0.2784	0.2784	0.1542	0.1353	0.0499
	90	0.6078	0.4208	0.4164	0.4164	0.3261	0.2460	0.1969
	120	0.8219	0.4849	0.4491	0.4491	0.3543	0.3078	0.2018
	150	0.8432	0.5396	0.4868	0.4868	0.4127	0.3616	0.2768
NJ WARREN	30	6.3579	2.5046	7.6584	7.6584	6.7432	2.1916	5.2983
	60	1.9856	1.8020	3.7450	3.7450	2.3579	1.0674	1.0658
	90	1.0525	1.1197	1.6707	1.6707	0.7733	0.8342	0.4901
	120	0.6825	0.7153	0.7713	0.7713	0.6195	0.7103	0.5924
	150	0.6758	0.8695	0.9422	0.9422	0.8254	0.7310	0.6929
NY ALBANY SMSA	30	1.1168	0.6701	0.9134	0.9134	0.4866	0.9333	2.4490
	60	1.6849	0.6373	1.2441	1.2441	0.5297	1.7499	3.0247
	90	1.9766	0.8040	1.2713	1.2713	0.6821	1.8112	3.3553
	120	2.2722	1.0573	1.8252	1.8252	3.4004	2.8786	5.6430
	150	2.3308	1.1392	2.0333	2.0333	3.5098	3.1948	7.2916
NY BROOME & TIOGA	30	1.6501	1.2011	9.6535	9.6535	0.1347	1.4817	3.9849
	60	2.2372	3.0023	7.6370	7.6370	9.6192	2.5433	6.9885
	90	2.4778	3.3099	8.9135	8.9135	9.9775	11.8036	10.0953
	120	2.8407	3.2011	6.9689	6.9689	8.9346	9.3637	10.7770
	150	2.5466	3.3745	4.9711	4.9711	6.1072	6.5230	6.7200
NY CHENANGO	30	2.3200	6.1449	3.6995	3.6995	0.5643	8.2141	26.0846
	60	2.4262	2.4404	7.4280	7.4280	10.0178	7.5845	16.5920
	90	2.9419	2.9811	7.3482	7.3482	14.1538	7.1782	15.9843
	120	2.8629	3.0777	6.4518	6.4518	13.9926	7.0909	13.7779
	150	2.3514	2.7829	6.2595	6.2595	6.7859	8.2125	10.0725
NY COLUMBIA	30	6.1524	1.3146	2.4189	2.4189	0.1578	2.2611	5.0481
	60	1.7605	0.8802	1.1494	1.1494	0.7420	1.4986	3.0384
	90	2.0734	0.8666	1.7555	1.7555	0.7046	1.3668	2.6728
	120	1.2811	0.7002	1.6036	1.6036	1.6389	1.6109	3.6096
	150	0.8168	0.3635	0.6725	0.6725	0.5908	0.6373	1.1310
NY DELAWARE	30	8.4162	5.2522	6.1381	6.1381	83.4657	44.7386	90.9327
	60	3.2315	4.1895	3.1990	3.1990	22.7015	15.8326	32.9480
	90	3.3459	2.3128	6.1562	6.1562	8.4393	7.5592	16.8215
	120	2.3623	1.9647	5.3347	5.3347	4.7231	4.3198	8.1235
	150	2.2950	1.9376	4.5403	4.5403	4.2416	4.6857	5.8934
NY DUTCHESS	30	1.8320	1.0776	0.9468	0.9468	1.1777	1.1315	3.2329
	60	2.5703	0.8045	1.9828	1.9828	0.6676	1.2384	1.9494
	90	1.6831	0.5145	1.3565	1.3565	0.6210	1.0226	2.0226
	120	0.7443	0.3247	0.6293	0.6293	0.5215	0.5687	0.9723
	150	0.7720	0.3656	0.9972	0.9972	0.5877	0.7017	0.9961
NY GREENE	30	7.1407	2.3541	5.9636	5.9636	2.1971	15.2230	9.6517
	60	1.9766	0.8040	1.2713	1.2713	0.6821	1.8112	3.3553
	90	2.2393	1.2768	1.8006	1.8006	4.5703	3.7780	9.5837
	120	2.6102	1.3944	3.1140	3.1140	3.9168	3.5377	7.0351
	150	1.7152	1.0575	3.3577	3.3577	2.0506	2.7137	4.6319
NY NASSAU & SUFFOLK	30	2.4766	0.4733	0.0443	0.0443	0.0011	0.3405	0.0965
	60	2.4766	0.4733	0.0443	0.0443	0.0011	0.3405	0.0965
	90	0.7218	0.2229	0.0326	0.0326	0.0009	0.1427	0.0375
	120	0.6912	0.2340	0.2295	0.2295	0.0270	0.1613	0.0403
	150	0.6812	0.2635	0.2404	0.2404	0.0948	0.2072	0.0601
NY NEW YORK CITY	30	0.2682	0.1582	0.0296	0.0296	0.0009	0.0915	0.0223
	60	0.3154	0.2154	0.2703	0.2703	0.0298	0.1758	0.0456
	90	0.7004	0.2588	0.3429	0.3429	0.0948	0.2259	0.0680
	120	0.8015	0.3991	0.5399	0.5395	0.2757	0.2875	0.1860
	150	0.9532	0.4063	0.5553	0.5553	0.3644	0.3446	0.4461

EDG ASSOCIATES, INC.

TABLE 4.A.8 --COUNTY GROUP SUPPLY-ACCESSIBILITY INDEXES--RATIO OF SUPPLY FRACTION TO POPULATION FRACTION BY 30 MINUTE TIME DISTANCE INTERVALS, 7 ACTIVITIES, TOCKS ISLAND LAKE RECREATION SERVICE AREA, 1974

COUNTY GROUP	MINUTES	SWIMMING	PICNIC	BOATING	FISHING	HUNTING	HIKING	CAMPING
NY ORANGE	30	1.5309	0.4162	0.5676	0.5676	0.0505	2.0812	0.6605
	60	1.1590	0.8414	1.9172	1.9172	1.2037	1.4934	2.9140
	90	0.5945	0.3677	0.5495	0.5995	0.3948	0.4400	0.7290
	120	0.5790	0.4421	0.9747	0.9747	0.3928	0.5959	0.6541
	150	0.8358	0.6357	1.1290	1.1290	0.7437	0.9189	0.9036
NY OTSEGO	30	1.2176	2.7902	1.4205	1.4205	3.4497	4.0702	6.2907
	60	3.7697	4.5859	3.5754	3.5754	47.1265	18.1491	38.4162
	90	2.4262	2.4404	7.4280	7.4280	10.0178	7.5045	16.5920
	120	2.1413	1.2591	3.0929	3.0929	3.4551	3.4719	7.2344
	150	2.0823	1.9230	4.3655	4.3655	4.9940	4.0813	7.9732
NY PUTNAM	30	0.4582	0.6084	0.4237	0.4237	0.0197	0.7416	0.2562
	60	0.6881	0.4760	1.0124	1.0123	0.1302	0.6086	0.3608
	90	0.5546	0.2778	0.5767	0.5767	0.1369	0.2942	0.1973
	120	0.7022	0.2912	0.7541	0.7541	0.2541	0.3870	0.5966
	150	0.7072	0.3945	0.9663	0.9663	0.6123	0.6520	0.9207
NY ROCKLAND & WESTCHESTER	30	0.4582	0.6084	0.4237	0.4237	0.0197	0.7416	0.2562
	60	0.3714	0.2219	0.3018	0.3018	0.0094	0.2191	0.0502
	90	0.3378	0.2345	0.3894	0.3894	0.0426	0.2128	0.0891
	120	0.7309	0.3099	0.7468	0.7468	0.3060	0.3527	0.5533
	150	1.0610	0.3735	0.8073	0.8073	0.3437	0.4745	0.5111
NY SCHOHARIE	30	0.4961	2.1741	1.2847	1.2847	0.1976	4.0517	5.1387
	60	1.7589	1.0471	1.4341	1.4341	5.0833	4.0639	7.6924
	90	2.2591	0.9491	1.4848	1.4848	4.3127	3.6939	7.1962
	120	1.9288	1.2386	2.7662	2.7662	3.0331	2.9981	6.4655
	150	1.8583	1.1411	2.5042	2.5042	2.5772	2.8100	5.5995
NY SULLIVAN	30	0.1554	5.8900	12.1324	12.1324	23.5097	18.3749	83.0141
	60	4.3240	1.9071	12.9659	12.9659	5.2655	8.9778	13.1518
	90	3.8127	2.3041	8.5381	8.5381	9.3061	8.6403	13.5321
	120	1.5398	1.4227	3.1372	3.1372	2.3607	3.0338	3.3405
	150	0.7381	0.7127	1.1586	1.1586	0.9251	1.1149	1.2771
NY ULSTER	30	1.0320	1.0776	0.9468	0.9468	1.1777	1.1315	3.2329
	60	2.7989	1.3228	2.0359	2.0359	2.5113	3.5043	8.9756
	90	2.4260	1.3097	2.8732	2.8732	4.3178	3.6719	8.0660
	120	1.4609	1.0752	1.7916	1.7916	2.0318	1.8319	3.4726
	150	0.6785	0.4724	1.1674	1.1674	0.6131	0.7899	1.1807
CT FAIRFIELD	30	0.7991	0.0261	2.1535	2.1535	0.0063	0.0150	0.0000
	60	1.3059	0.2992	1.1755	1.1755	0.1174	0.3619	0.1706
	90	0.5706	0.1546	0.3486	0.3486	0.0514	0.1721	0.0912
	120	0.6081	0.1703	0.4164	0.4164	0.0500	0.2282	0.1264
	150	0.6914	0.2168	0.6150	0.6150	0.2506	0.3569	0.3068
CT LITCHFIELD	30	5.3342	0.2807	6.3168	6.3168	0.6417	0.0000	0.0000
	60	1.8751	0.2365	1.5787	1.5787	0.2764	0.1351	0.3256
	90	1.9734	0.3007	1.6467	1.6467	0.2761	0.2125	0.4670
	120	1.4146	0.4658	1.1578	1.1578	0.2946	0.8420	0.8577
	150	0.7089	0.2241	0.4381	0.4381	0.4121	0.4886	0.6508
CT NEW HAVEN	30	2.6949	0.0974	0.3505	0.3505	0.2025	0.1908	0.2453
	60	2.0470	0.0803	1.7080	1.7080	0.1067	0.0925	0.1099
	90	1.8751	0.2365	1.5787	1.5787	0.2764	0.1351	0.3256
	120	1.3314	0.3743	1.1351	1.1351	0.1178	0.3688	0.2989
	150	0.6273	0.1640	0.3637	0.3637	0.0519	0.2229	0.1285
DE NEW CASTLE	30	0.2042	0.7531	0.6574	0.6574	0.3957	0.7659	0.3093
	60	0.2691	0.6720	0.2259	0.2259	0.4914	0.3064	0.3232
	90	0.4633	1.4089	1.1346	1.1346	0.8686	0.4664	0.6272
	120	0.9601	1.6503	0.9818	0.9818	1.0468	0.6339	0.6925
	150	0.8481	1.8221	0.9049	0.9049	1.2636	0.7733	0.8847

TABLE 4.A.9—FRACTION OF ACTIVITY DAYS AT TIME DISTANCES GREATER THAN STATED VALUES, 12 ACTIVITIES, FROM 1974 PENNSYLVANIA RECREATION SURVEY

MINUTES	SWIM-MING	PICNIC-KING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
00	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
10	0.614	0.866	0.818	0.796	0.745	0.726	0.977	0.781	0.493	0.574	0.699	0.433
20	0.396	0.712	0.780	0.630	0.551	0.546	0.921	0.558	0.329	0.286	0.387	0.139
30	0.271	0.561	0.691	0.497	0.393	0.410	0.836	0.289	0.212	0.121	0.159	0.048
40	0.244	0.472	0.627	0.431	0.336	0.356	0.775	0.233	0.184	0.092	0.127	0.040
50	0.218	0.383	0.563	0.366	0.280	0.301	0.714	0.176	0.156	0.063	0.094	0.031
60	0.191	0.294	0.499	0.300	0.223	0.247	0.653	0.120	0.128	0.034	0.062	0.023
70	0.177	0.263	0.452	0.270	0.205	0.225	0.600	0.106	0.115	0.030	0.058	0.022
80	0.162	0.232	0.404	0.240	0.186	0.202	0.547	0.092	0.102	0.026	0.053	0.020
90	0.148	0.202	0.357	0.211	0.168	0.180	0.494	0.078	0.089	0.023	0.049	0.019
100	0.134	0.171	0.310	0.181	0.149	0.158	0.441	0.064	0.076	0.019	0.044	0.017
110	0.119	0.140	0.262	0.151	0.131	0.135	0.388	0.050	0.063	0.315	0.040	0.016
120	0.105	0.109	0.215	0.121	0.112	0.113	0.335	0.036	0.050	0.011	0.035	0.014
130	0.101	0.104	0.204	0.114	0.106	0.108	0.319	0.034	0.046	0.010	0.034	0.013
140	0.098	0.098	0.192	0.107	0.100	0.102	0.303	0.032	0.043	0.010	0.033	0.013
150	0.094	0.093	0.181	0.100	0.093	0.097	0.287	0.031	0.039	0.009	0.031	0.012
160	0.090	0.087	0.169	0.093	0.087	0.091	0.270	0.029	0.036	0.008	0.030	0.012
170	0.087	0.082	0.158	0.086	0.081	0.086	0.254	0.027	0.032	0.007	0.029	0.011
180	0.083	0.077	0.147	0.080	0.075	0.080	0.238	0.025	0.029	0.007	0.028	0.011
190	0.079	0.071	0.135	0.073	0.068	0.075	0.222	0.023	0.025	0.006	0.026	0.010
200	0.076	0.066	0.124	0.066	0.062	0.069	0.206	0.021	0.021	0.005	0.025	0.009
210	0.072	0.060	0.112	0.059	0.056	0.064	0.190	0.020	0.018	0.004	0.024	0.009
220	0.068	0.055	0.101	0.052	0.050	0.058	0.173	0.018	0.014	0.004	0.023	0.008
230	0.065	0.049	0.089	0.045	0.043	0.053	0.157	0.016	0.011	0.003	0.021	0.008
240	0.061	0.044	0.078	0.038	0.037	0.047	0.141	0.014	0.007	0.002	0.020	0.007

IOE ASSOCIATES, INC.

TABLE 4.A.18---ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1974 - 2,025--MEDIUM POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
TOTAL SERVICE AREA													
1974		94642	28878	28771	21477	8490	31220	30994	3963	6022	1615	6190	3636
1985		109856	31621	34642	23422	9264	33946	33462	4673	6234	1675	7493	4736
1995		123559	33860	39912	25344	10027	36649	36036	5433	6541	1780	8577	5674
2005		135689	35623	44719	27111	10750	39162	38375	6159	6977	1924	9642	6706
2015		146261	37477	48844	28769	11377	41431	40602	6836	7415	2062	10533	7575
2025		154730	38968	52106	30125	11938	43358	42377	7361	7720	2164	11294	8288
PA TOTAL													
1974		20975	6381	6029	4915	2000	7157	7223	835	1351	388	1407	795
1985		24210	6878	7199	5276	2150	7681	7693	939	1372	388	1660	1021
1995		27196	7279	8292	5639	2301	8204	8179	1082	1427	407	1936	1248
2005		29836	7641	9281	6003	2452	8727	8656	1215	1519	437	2178	1480
2015		32284	8023	10220	6348	2595	9220	9104	1371	1611	469	2409	1718
2025		34470	8387	11043	6674	2732	9686	9512	1515	1689	496	2629	1944
PA BERKS													
1974	115	813	215	227	177	79	267	284	24	46	83	51	28
1985	115	936	228	274	187	84	282	299	27	46	81	60	37
1995	115	1036	238	313	197	88	297	314	31	47	83	67	44
2005	115	1128	246	351	207	93	312	330	35	50	86	73	52
2015	115	1205	256	381	217	97	327	345	39	52	90	79	58
2025	115	1273	265	407	226	101	341	359	42	54	93	83	63
PA BRADFORD													
1974	135	126	34	32	28	13	43	48	4	7	1	8	4
1985	135	148	36	39	30	14	46	51	4	8	1	9	5
1995	135	170	39	46	32	15	50	55	5	8	1	11	7
2005	135	190	41	53	35	16	53	59	5	8	1	12	8
2015	135	209	43	60	37	17	57	63	6	9	1	14	9
2025	135	226	45	66	39	18	60	66	6	9	1	15	10
PA BUCKS													
1974	100	1511	447	463	355	139	487	535	59	103	16	93	56
1985	100	1822	506	589	400	157	549	600	73	109	17	114	76
1995	100	2120	564	707	448	176	615	671	90	119	18	133	92
2005	100	2396	611	817	495	194	680	741	104	130	20	151	110
2015	100	2657	664	917	543	213	746	812	117	143	22	168	126
2025	100	2898	715	1007	588	231	808	879	128	154	23	184	139
PA CARBON													
1974	50	237	110	78	81	32	111	95	15	21	5	19	8
1985	50	280	118	96	86	34	118	101	17	21	5	23	10
1995	50	326	126	114	93	36	128	109	19	22	5	27	13
2005	50	375	136	135	102	40	140	118	22	24	6	31	16
2015	50	425	147	158	110	43	152	129	26	26	6	36	20
2025	50	471	157	178	119	47	164	138	30	28	7	40	23
PA CENTRE													
1974	200	180	42	38	30	14	50	58	5	7	1	11	6
1985	200	204	44	45	31	14	52	60	5	7	1	13	7
1995	200	225	45	51	32	15	54	62	5	7	1	14	8
2005	200	242	46	56	33	15	56	64	6	7	1	15	10
2015	200	257	47	61	34	16	58	66	6	8	1	16	11
2025	200	267	47	64	35	16	59	67	7	8	1	17	12
PA CHESTER													
1974	140	725	166	191	136	58	202	237	20	37	5	45	28
1985	140	922	198	254	162	70	241	281	25	42	6	58	40
1995	140	1122	230	318	190	81	282	328	32	48	7	72	51
2005	140	1328	262	385	220	94	327	380	39	55	8	85	64
2015	140	1541	298	451	252	108	375	435	46	63	9	99	76
2025	140	1761	336	519	286	123	425	494	53	71	10	113	88
PA CLINTON													
1974	175	70	17	16	14	6	23	25	2	3	0	4	2
1985	175	78	18	19	14	7	23	25	2	3	0	5	3
1995	175	85	18	21	14	7	23	25	2	3	0	5	3
2005	175	88	18	22	15	7	24	26	2	3	0	6	3
2015	175	94	18	24	15	7	24	26	2	3	0	6	4
2025	175	97	18	25	15	7	24	26	2	3	0	6	4
PA COLUMBIA													
1974	100	164	56	48	45	19	64	67	7	12	2	10	5
1985	100	191	59	58	47	20	68	70	7	12	2	12	6
1995	100	215	60	68	49	20	70	72	8	12	2	14	8
2005	100	232	61	76	50	21	72	74	9	13	2	15	9
2015	100	247	62	82	52	21	74	76	9	13	2	16	11
2025	100	258	63	88	53	22	76	77	10	13	2	17	12
PA HARRISBURG SMSA													
1974	162	903	210	220	168	75	265	298	23	43	6	55	32
1985	162	1063	230	270	183	82	289	323	27	44	6	66	41
1995	162	1214	248	317	199	89	315	351	31	46	6	77	50
2005	162	1350	263	361	214	96	339	377	35	50	7	86	59
2015	162	1457	274	398	226	101	357	397	39	52	7	93	67
2025	162	1549	285	429	236	105	373	415	42	54	7	99	74
PA LACKAWANNA													
1974	60	987	387	334	297	115	415	388	50	79	13	60	29
1985	60	1093	389	383	298	115	417	387	51	75	12	68	36
1995	60	1405	389	427	302	116	422	391	55	76	12	74	42
2005	60	1258	389	468	305	118	427	395	61	75	12	79	49
2015	60	1311	389	499	307	119	430	390	65	75	12	83	54
2025	60	1340	387	518	308	119	431	390	68	75	12	85	57

IDR ASSOCIATES, INC.

TABLE 4.A.10 ---ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025---MEDIUM POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM-MING	PICNIC-KING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
PA LANCASTER													
1974	170	680	157	160	122	57	201	220	17	31	4	42	23
1985	170	832	179	204	139	65	228	248	20	33	4	53	30
1995	170	953	193	241	151	71	248	270	24	35	5	61	37
2005	170	1051	203	272	161	76	265	288	26	37	5	68	44
2015	170	1140	213	302	171	80	281	305	30	39	5	74	50
2025	170	1220	223	327	180	85	296	321	33	41	5	79	55
PA LEBANON													
1974	132	241	61	62	50	23	78	86	6	13	2	15	8
1985	132	287	67	77	55	26	86	94	7	14	2	18	10
1995	132	328	72	91	60	28	93	101	8	14	2	21	13
2005	132	360	75	103	63	29	98	107	10	15	2	24	15
2015	132	390	78	115	67	31	103	113	11	16	2	26	18
2025	132	415	81	124	70	32	108	118	12	17	2	27	19
PA LEHIGH & NORTHAMPTON													
1974	50	2339	1051	782	759	290	1025	898	153	208	52	188	86
1985	50	2709	1126	938	809	309	1093	953	168	209	51	222	106
1995	50	3089	1197	1097	870	333	1175	1023	192	219	53	255	130
2005	50	3478	1278	1265	941	360	1272	1105	218	236	58	290	156
2015	50	3850	1361	1432	1009	386	1364	1185	250	254	62	322	183
2025	50	4190	1438	1584	1074	411	1451	1260	277	268	65	352	207
PA LUZERNE													
1974	70	1321	506	437	388	154	554	516	63	103	17	81	40
1985	70	1459	505	500	386	153	551	511	64	97	15	92	49
1995	70	1575	502	557	388	154	554	513	70	95	15	100	58
2005	70	1666	501	607	391	155	558	517	77	95	15	106	67
2015	70	1727	499	643	393	156	561	519	82	96	15	111	73
2025	70	1770	499	668	394	157	563	520	86	96	15	114	78
PA LYCOMING													
1974	150	240	61	60	49	23	78	86	7	13	2	15	8
1985	150	270	62	70	50	23	80	87	7	12	2	17	10
1995	150	297	63	79	51	24	82	89	8	12	2	19	12
2005	150	316	63	88	52	24	83	90	9	12	2	20	14
2015	150	331	63	94	53	25	85	92	9	12	2	21	15
2025	150	340	64	98	54	25	86	93	10	12	2	22	16
PA MONROE													
1974	15	493	224	98	157	70	225	127	58	58	37	97	63
1985	15	670	280	136	195	87	280	157	72	68	43	134	91
1995	15	902	346	187	243	108	350	195	93	83	52	182	132
2005	15	1168	415	249	296	132	426	238	114	100	63	240	182
2015	15	1451	490	315	352	157	506	282	141	119	74	300	241
2025	15	1767	571	392	414	185	596	332	175	139	86	368	311
PA MONTGOMERY													
1974	100	2209	617	696	502	197	695	747	84	136	21	137	83
1985	100	2531	672	834	544	216	756	805	99	139	21	159	106
1995	100	2821	718	953	587	231	813	868	116	146	22	178	125
2005	100	2999	753	1015	625	245	866	922	120	155	23	190	133
2015	100	3219	788	1108	659	259	913	972	133	164	25	204	149
2025	100	3392	817	1179	688	270	953	1014	143	171	25	215	161
PA MONTOUR													
1974	110	46	14	13	12	5	17	18	2	3	9	3	2
1985	110	53	15	16	12	5	18	19	2	3	9	3	2
1995	110	61	15	18	13	6	19	20	2	3	9	4	2
2005	110	67	16	21	14	6	20	21	2	3	10	4	3
2015	110	73	17	23	14	6	21	22	2	3	10	5	3
2025	110	75	17	24	14	6	22	22	3	3	10	5	4
PA NORTHUMBERLAND													
1974	135	202	56	51	48	22	75	81	6	12	2	13	6
1985	135	237	59	62	49	23	78	83	6	12	2	15	8
1995	135	273	61	74	52	25	82	88	7	12	2	18	10
2005	135	302	63	85	55	26	86	92	8	12	2	20	12
2015	135	325	65	93	56	27	89	95	8	13	2	21	14
2025	135	343	67	100	58	27	91	98	9	13	2	23	16
PA PHILADELPHIA & DELAWARE													
1974	120	5831	1458	1576	1121	445	1711	1860	161	317	45	332	209
1985	120	6544	1534	1833	1174	465	1792	1936	177	314	43	382	257
1995	120	6980	1542	2005	1193	473	1821	1964	191	309	42	413	291
2005	120	7261	1528	2131	1200	476	1832	1973	201	309	43	434	320
2015	120	7431	1512	2223	1196	474	1826	1966	212	309	42	446	344
2025	120	7479	1486	2266	1182	469	1805	1942	217	304	41	450	357
PA PIKE													
1974	15	144	57	30	42	19	60	33	15	14	9	29	20
1985	15	213	77	46	56	25	81	45	21	18	11	44	33
1995	15	280	93	61	69	31	100	55	27	21	13	59	46
2005	15	362	113	81	86	38	123	68	36	26	15	76	64
2015	15	460	138	105	105	47	152	83	46	31	19	97	86
2025	15	571	166	133	128	58	185	101	58	38	22	121	110
PA SCHUYLKILL													
1974	105	513	138	158	111	49	168	167	17	29	43	33	19
1985	105	444	144	131	116	51	174	172	16	28	41	28	14
1995	105	491	150	145	122	53	183	180	16	29	42	31	16
2005	105	546	154	165	128	56	193	190	17	30	44	35	19
2015	105	610	161	189	135	59	203	199	19	31	46	39	23
2025	105	715	166	236	141	62	212	208	25	33	47	47	32

IDE ASSOCIATES, INC.

TABLE 4.A.18---ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE,
12 ACTIVITIES, 1,974 - 2,025--MEDIUM POPULATION GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA SNYDER													
1974	165	60	15	14	12	6	20	22	2	3	0	4	2
1985	165	76	18	19	14	6	22	25	2	3	0	5	3
1995	165	92	19	23	16	7	25	28	2	4	0	6	4
2005	165	105	21	28	17	8	27	30	3	4	1	7	4
2015	165	119	23	32	19	9	30	33	3	4	1	8	5
2025	165	130	24	35	20	9	32	35	4	5	1	8	6
PA SULLIVAN													
1974	140	12	3	3	3	1	4	5	0	1	0	1	0
1985	140	13	3	3	3	1	4	5	0	1	0	1	0
1995	140	14	3	4	3	1	4	5	0	1	0	1	1
2005	140	15	3	4	3	1	4	5	0	1	0	1	1
2015	140	16	3	4	3	1	4	5	0	1	0	1	1
2025	140	17	3	5	3	1	4	5	0	1	0	1	1
PA SUSQUEHANNA													
1974	95	110	39	33	31	13	44	45	5	9	1	7	3
1985	95	133	43	42	34	14	48	49	5	9	1	8	5
1995	95	162	48	52	39	16	55	56	6	10	2	10	6
2005	95	189	53	63	43	17	61	62	8	11	2	12	8
2015	95	217	58	74	48	19	68	69	9	12	2	14	9
2025	95	243	63	84	52	21	74	75	10	13	2	16	11
PA UNION													
1974	135	66	18	17	14	6	22	25	2	4	1	4	2
1985	135	79	19	21	16	7	24	27	2	4	1	5	3
1995	135	93	21	25	18	8	27	30	3	4	1	6	4
2005	135	106	23	30	19	9	29	33	3	5	1	7	4
2015	135	119	25	34	21	9	31	36	3	5	1	8	5
2025	135	131	26	38	22	10	34	38	4	6	1	9	6
PA WAYNE													
1974	40	166	86	55	61	24	82	66	13	16	5	16	7
1985	40	206	96	71	68	26	92	74	15	17	5	20	9
1995	40	257	109	91	78	30	105	84	19	19	6	26	12
2005	40	313	125	114	90	35	122	97	23	22	6	31	16
2015	40	368	140	137	102	40	138	110	28	25	7	37	20
2025	40	421	156	159	114	44	154	123	33	27	8	43	24
PA WYOMING													
1974	85	68	26	21	20	8	28	29	3	6	1	4	2
1985	85	81	28	26	22	9	30	31	4	6	1	5	3
1995	85	96	30	32	24	9	33	34	4	6	1	6	3
2005	85	110	33	38	27	10	36	37	5	7	1	7	4
2015	85	120	34	42	28	11	38	39	5	7	1	8	5
2025	85	128	35	46	29	11	40	40	6	7	1	8	6
PA YORK													
1974	195	518	111	113	85	39	142	159	12	18	3	32	17
1985	195	632	126	143	96	44	161	179	14	20	3	40	23
1995	195	737	138	172	107	49	178	198	16	21	3	47	28
2005	195	833	148	200	117	53	195	217	19	23	3	53	34
2015	195	916	159	225	125	57	210	233	22	25	4	58	40
2025	195	983	167	244	132	60	222	246	24	26	4	63	44
NJ TOTAL													
1974		27266	8983	8929	6766	2503	9236	9212	1327	1906	499	1842	1064
1985		33747	10523	11445	7875	2933	10757	10603	1713	2112	567	2429	1520
1995		38835	11602	13456	8768	3275	11973	11765	2034	2284	623	2815	1828
2005		43639	12467	15408	9566	3581	13064	12797	2383	2488	689	3262	2252
2015		47539	13302	16953	10285	3858	14046	13728	2667	2678	747	3601	2558
2025		50689	13989	18172	10878	4088	14859	14476	2882	2821	792	3892	2804
NJ BERGEN													
1974	70	4244	1358	1492	1072	392	1428	1451	200	289	47	264	160
1985	70	4890	1504	1769	1180	432	1571	1589	240	301	47	308	203
1995	70	5423	1607	2031	1271	465	1693	1711	278	316	49	343	237
2005	70	5906	1698	2246	1362	499	1814	1831	307	339	53	375	268
2015	70	6309	1786	2420	1442	528	1921	1939	333	360	56	401	292
2025	70	6689	1872	2580	1520	557	2025	2042	354	377	58	425	313
NJ ESSEX													
1974	75	3434	1179	1166	849	266	1131	1149	166	246	40	191	121
1985	75	4010	1295	1409	929	291	1237	1249	192	254	41	229	153
1995	75	4270	1305	1536	945	296	1258	1269	207	250	40	246	172
2005	75	4470	1308	1638	962	301	1281	1289	218	253	40	260	189
2015	75	4619	1314	1716	976	305	1299	1306	229	255	40	270	202
2025	75	4751	1324	1782	990	310	1317	1324	237	258	41	279	212
NJ HUDSON													
1974	85	2204	753	714	513	215	798	704	96	149	25	132	74
1985	85	2426	768	816	522	218	812	712	103	143	24	148	90
1995	85	2656	788	918	542	227	843	738	114	144	24	164	105
2005	85	2867	810	1016	564	236	876	766	127	149	24	178	121
2015	85	3031	829	1094	581	243	902	789	138	154	25	189	134
2025	85	3167	844	1158	596	249	927	809	147	157	25	198	144
NJ HUNTERDON													
1974	45	440	186	151	133	50	174	152	31	37	10	40	19
1985	45	620	246	224	175	65	229	199	45	46	13	57	30
1995	45	827	312	308	224	84	294	255	62	57	16	76	43
2005	45	1001	364	381	263	99	348	301	78	67	18	93	55
2015	45	1160	413	447	303	113	397	344	92	77	21	108	66
2025	45	1313	461	509	341	127	446	386	104	86	23	122	76

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TABLE 4.A.18---ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--MEDIUM POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ MERCER													
1974	80	1274	420	425	323	110	426	448	58	91	14	79	45
1985	80	1569	486	548	371	126	488	512	72	99	15	96	61
1995	80	1868	548	670	423	144	557	583	89	109	17	113	78
2005	80	2159	606	792	477	162	627	655	105	122	19	131	95
2015	80	2425	665	901	527	179	694	724	120	135	21	148	110
2025	80	2554	689	957	549	187	723	754	127	140	21	156	118
NJ MIDDLESEX													
1974	80	2501	819	833	627	231	837	880	114	181	29	192	89
1985	80	3122	968	1096	734	270	981	1026	149	201	32	196	125
1995	80	3728	1106	1348	846	311	1130	1181	187	225	35	233	160
2005	80	4172	1191	1541	929	342	1240	1294	214	246	38	261	188
2015	80	4535	1274	1692	1000	368	1336	1394	237	265	41	284	210
2025	80	4804	1334	1804	1054	388	1407	1467	251	278	43	302	229
NJ MONMOUTH													
1974	115	1349	345	387	284	117	406	461	43	78	141	83	52
1985	115	1730	417	517	341	140	489	552	56	89	156	109	74
1995	115	2071	475	635	392	162	562	633	69	99	174	131	94
2005	115	2367	522	741	437	180	627	706	80	110	193	150	113
2015	115	2621	564	830	478	197	684	770	90	120	209	167	128
2025	115	2824	599	902	510	210	731	822	97	128	221	180	141
NJ MORRIS													
1974	60	1993	675	712	519	184	672	695	103	146	24	122	73
1985	60	2486	802	935	613	217	794	817	136	163	26	155	103
1995	60	3124	972	1204	749	265	970	997	179	194	31	195	136
2005	60	3654	1107	1428	867	307	1124	1153	212	224	36	229	164
2015	60	4033	1205	1585	952	337	1234	1266	235	246	39	253	184
2025	60	4280	1268	1688	1007	357	1306	1339	248	259	41	269	196
NJ OCEAN													
1974	125	605	153	162	133	60	200	223	16	33	4	38	21
1985	125	1005	231	280	202	90	303	337	27	47	6	64	38
1995	125	1300	279	373	246	110	369	409	35	56	7	84	53
2005	125	1536	311	454	278	124	418	463	42	63	8	100	68
2015	125	1707	335	513	302	135	454	502	48	68	9	111	79
2025	125	1806	346	549	314	141	472	522	51	71	9	118	86
NJ PASSAIC													
1974	50	2470	1011	851	710	255	949	837	158	196	50	194	98
1985	50	2883	1106	1032	776	279	1037	911	184	206	51	231	125
1995	50	3221	1175	1185	831	299	1111	973	211	212	52	261	149
2005	50	3489	1225	1310	874	314	1169	1024	234	223	55	286	170
2015	50	3733	1275	1426	917	330	1226	1074	257	234	57	304	190
2025	50	3957	1325	1528	960	345	1283	1122	276	243	59	324	207
NJ PHILADELPHIA SMSA-NJ													
1974	125	2272	552	612	451	191	665	772	64	126	17	138	86
1985	125	3052	693	865	563	238	830	958	86	148	20	190	126
1995	125	3585	773	1046	633	268	933	1076	106	163	22	225	159
2005	125	4086	844	1220	704	298	1037	1194	123	180	24	258	191
2015	125	4546	919	1373	773	327	1139	1311	139	197	26	287	219
2025	125	4996	995	1521	843	356	1241	1427	154	215	28	316	245
NJ SALEM													
1974	165	133	30	32	25	10	37	44	3	6	1	8	5
1985	165	182	38	46	31	13	47	55	5	7	1	11	7
1995	165	205	41	54	33	14	50	59	5	8	1	13	9
2005	165	229	44	62	36	15	54	64	6	8	1	14	10
2015	165	247	46	67	38	15	58	68	7	9	1	15	12
2025	165	261	47	72	40	16	60	70	7	9	1	16	12
NJ SOMERSET													
1974	60	1032	349	368	269	94	348	361	53	75	12	63	37
1985	60	1271	411	476	315	110	407	419	69	83	13	79	52
1995	60	1487	464	571	358	126	463	476	84	92	15	93	64
2005	60	1632	493	636	388	136	501	515	93	99	16	102	73
2015	60	1798	536	706	425	149	549	564	104	109	17	112	81
2025	60	1849	554	722	440	154	570	585	104	113	18	115	82
NJ SUSSEX													
1974	20	413	175	107	118	50	162	106	48	40	22	76	40
1985	20	1301	514	355	344	146	475	307	149	111	59	244	141
1995	20	1463	641	376	434	184	598	386	165	135	71	288	133
2005	20	2085	748	603	514	218	708	457	257	160	84	395	259
2015	20	2414	846	708	586	249	808	521	305	183	96	458	311
2025	20	2698	931	798	649	276	895	577	343	201	104	513	354
NJ UNION													
1974	85	2178	667	729	530	189	706	742	93	142	23	132	81
1985	85	2310	673	806	531	190	708	741	102	135	21	143	95
1995	85	2453	684	878	545	195	727	759	112	134	21	152	106
2005	85	2555	687	931	558	199	743	775	119	136	21	159	116
2015	85	2629	696	967	568	203	757	789	124	139	21	164	122
2025	85	2694	704	997	578	206	770	802	128	140	21	169	127
NJ WARREN													
1974	20	725	311	187	210	91	296	187	80	71	38	133	67
1985	20	930	369	251	248	107	350	219	101	79	42	174	97
1995	20	1157	432	323	294	127	414	259	130	91	48	219	138
2005	20	1430	509	410	351	152	495	310	168	108	57	272	173
2015	20	1732	599	506	417	181	588	368	210	128	67	330	219
2025	20	2045	694	604	486	211	686	428	251	148	77	390	266

IDE ASSOCIATES, INC.

TABLE 4.A.10---ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--MEDIUM POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY TOTAL													
1974		40936	12215	12311	8732	3531	13243	12770	1645	2400	481	2604	1569
1985		45498	12792	14175	9108	3682	13773	13218	1837	2455	478	2983	1927
1995		50296	13431	16041	9664	3906	14573	13962	2100	2518	502	3366	2275
2005		54189	13864	17628	10161	4125	15312	14614	2317	2634	536	3690	2597
2015		57678	14389	19022	10650	4286	15947	15285	2528	2763	570	3964	2877
2025		60193	14732	20034	10996	4440	16458	15755	2674	2829	591	4174	3080
NY ALBANY SMSA													
1974	145	1718	401	442	319	150	514	551	45	84	12	107	61
1985	145	1971	431	529	341	160	549	586	51	85	12	125	78
1995	145	2176	450	601	360	169	579	617	58	87	12	139	92
2005	145	2365	466	669	379	178	610	649	65	91	13	152	107
2015	145	2534	486	730	398	187	640	681	72	96	14	163	119
2025	145	2679	503	780	416	195	668	710	76	99	14	173	129
NY BROOME & TIOGA													
1974	125	647	161	173	132	61	205	224	18	36	5	41	23
1985	125	724	167	203	137	64	212	230	20	35	5	46	29
1995	125	790	173	228	142	66	220	239	22	36	5	51	33
2005	125	844	176	249	147	69	228	247	24	37	5	55	38
2015	125	886	180	266	151	71	235	255	26	38	5	58	42
2025	125	920	184	279	155	72	241	261	28	38	5	60	44
NY CHENANGO													
1974	175	90	21	21	18	8	28	32	2	4	1	6	3
1985	175	107	23	26	19	9	30	34	3	4	1	7	4
1995	175	121	24	30	20	9	32	37	3	4	1	8	5
2005	175	134	26	34	22	10	34	39	3	5	1	9	6
2015	175	144	27	38	23	10	35	41	4	5	1	9	6
2025	175	152	27	40	24	11	37	42	4	5	1	10	7
NY COLUMBIA													
1974	135	124	31	32	27	12	41	45	3	7	1	8	4
1985	135	151	35	41	30	13	46	50	4	7	1	10	6
1995	135	176	38	49	32	15	50	54	5	7	1	11	7
2005	135	197	40	57	34	16	53	58	5	8	1	13	9
2015	135	215	42	63	37	17	57	62	6	9	1	14	10
2025	135	232	44	69	39	18	60	65	6	9	1	15	11
NY DELAWARE													
1974	145	97	25	24	21	10	33	36	3	5	1	6	3
1985	145	112	26	29	22	10	35	38	3	5	1	7	4
1995	145	135	30	36	25	12	39	43	3	6	1	9	5
2005	145	167	35	45	30	14	47	51	4	7	1	11	7
2015	145	213	43	59	37	17	58	63	6	9	1	14	9
2025	145	271	53	77	46	21	72	78	7	11	1	18	12
NY DUTCHESS													
1974	95	784	248	243	195	74	268	285	32	54	9	48	27
1985	95	978	290	318	227	86	310	329	39	59	9	61	38
1995	95	1196	334	403	263	100	360	381	51	67	10	75	50
2005	95	1419	379	488	304	115	416	439	61	77	12	89	63
2015	95	1876	497	657	393	135	515	569	84	105	16	115	88
2025	95	1912	487	676	397	151	543	573	85	100	15	121	90
NY GREENE													
1974	105	103	32	31	27	11	39	40	4	7	10	8	3
1985	105	129	36	40	31	13	44	46	4	7	11	8	5
1995	105	152	40	48	34	14	48	50	5	8	11	10	6
2005	105	175	43	57	37	15	53	55	6	9	13	11	7
2015	105	196	46	65	40	17	57	60	7	10	14	13	9
2025	105	219	51	74	44	18	63	65	8	10	15	14	10
NY NASSAU & SUFFOLK													
1974	160	6222	1314	1599	1069	469	1641	1909	165	275	38	389	252
1985	160	6942	1404	1865	1135	499	1744	2017	192	274	37	440	311
1995	160	7717	1509	2123	1225	538	1882	2176	224	290	39	491	365
2005	160	8360	1584	2333	1309	575	2011	2321	244	310	42	534	409
2015	160	8936	1670	2511	1390	610	2135	2464	264	330	44	571	445
2025	160	9490	1756	2680	1469	645	2256	2603	280	347	46	607	477
NY NEW YORK CITY													
1974	100	23556	7354	7307	4988	1993	7821	7181	924	1452	238	1353	829
1985	100	25281	7379	8089	4973	1987	7798	7124	970	1381	222	1483	966
1995	100	27044	7417	8847	5050	2018	7920	7224	1043	1348	216	1602	1090
2005	100	28177	7338	9413	5080	2030	7966	7249	1097	1349	215	1683	1199
2015	100	28895	7270	9805	5076	2028	7959	7237	1140	1343	213	1736	1278
2025	100	29258	7187	10043	5048	2017	7916	7189	1168	1327	209	1765	1330
NY ORANGE													
1974	25	1852	853	537	561	225	770	532	193	179	85	279	140
1985	25	2371	1012	720	662	266	909	624	243	200	93	365	200
1995	25	3025	1216	946	802	322	1102	756	320	235	108	469	275
2005	25	3583	1368	1150	918	369	1262	864	388	268	123	559	347
2015	25	4092	1510	1334	1028	413	1413	967	453	300	137	640	412
2025	25	4433	1614	1460	1099	442	1510	1033	494	319	145	694	458
NY OTSEGO													
1974	180	107	25	25	20	9	33	36	3	5	1	7	4
1985	180	127	27	30	22	10	36	39	3	5	1	8	5
1995	180	148	29	36	24	11	39	42	4	5	1	10	6
2005	180	165	31	42	25	12	41	45	4	6	1	11	7
2015	180	179	32	46	26	12	43	47	4	6	1	12	8
2025	180	190	33	50	28	13	45	49	5	6	1	13	9

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TABLE 4.A.10---ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025---MEDIUM POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY PUTNAM													
1974	105	206	58	62	47	19	66	72	8	13	19	13	8
1985	105	289	77	92	62	25	87	95	11	16	23	18	12
1995	105	381	97	125	79	32	110	120	15	20	29	24	17
2005	105	479	118	160	97	40	136	148	20	24	34	31	25
2015	105	585	142	197	117	48	164	178	24	30	43	38	28
2025	105	709	169	241	141	58	197	214	30	35	51	46	35
NY ROCKLAND & WESTCHESTER													
1974	90	4446	1307	1489	1020	380	1393	1452	192	279	45	275	178
1985	90	5033	1417	1754	1098	410	1500	1556	226	284	45	315	221
1995	90	5649	1534	2010	1198	447	1637	1696	262	300	47	355	250
2005	90	6182	1631	2230	1294	503	1800	1829	289	322	50	396	292
2015	90	6700	1737	2433	1391	519	1900	1965	319	348	54	423	322
2025	90	7175	1844	2616	1482	553	2025	2094	337	369	57	453	348
NY SCHOHARIE													
1974	155	59	15	15	13	6	20	22	2	3	0	4	2
1985	155	76	17	19	15	7	23	26	2	4	0	5	3
1995	155	93	20	24	17	8	27	29	2	4	1	6	4
2005	155	108	22	29	19	9	29	33	3	4	1	7	5
2015	155	112	23	29	20	9	32	35	3	5	1	7	6
2025	155	132	25	37	22	10	34	38	4	5	1	9	6
NY SULLIVAN													
1974	45	294	139	99	99	37	132	112	21	27	8	26	11
1985	45	375	166	130	118	44	157	132	26	30	8	34	16
1995	45	460	189	163	136	50	182	152	32	34	9	41	21
2005	45	583	228	211	166	61	222	185	40	41	11	53	28
2015	45	656	247	242	181	67	242	203	46	45	12	60	33
2025	45	772	282	289	208	77	279	233	54	51	14	71	40
NY ULSTER													
1974	70	630	231	212	178	66	240	241	31	50	8	38	21
1985	70	831	283	291	218	80	293	293	40	58	9	52	31
1995	70	1033	331	371	257	95	346	345	51	66	11	65	41
2005	70	1252	380	460	300	111	405	403	63	77	12	79	52
2015	70	1461	429	547	342	126	461	458	75	88	14	92	64
2025	70	1648	473	624	379	140	511	508	85	97	15	104	76
CT TOTAL													
1974		4535	1082	1265	892	384	1325	1486	130	238	240	283	175
1985		5227	1179	1520	967	417	1437	1604	153	244	234	332	223
1995		5884	1267	1755	1050	453	1561	1738	178	257	241	376	266
2005		6481	1342	1968	1131	488	1682	1871	199	275	253	416	307
2015		7040	1428	2160	1213	524	1805	2007	220	295	266	453	343
2025		7519	1503	2322	1285	555	1913	2124	236	310	275	485	372
CT FAIRFIELD													
1974	115	2300	560	672	464	194	670	752	72	129	224	144	93
1985	115	2554	592	778	488	204	704	787	82	124	218	162	114
1995	115	2798	623	873	518	216	748	834	93	128	223	178	132
2005	115	3006	648	953	547	229	790	880	102	134	234	192	147
2015	115	3187	676	1019	575	240	831	925	109	142	245	204	159
2025	115	3352	702	1077	602	251	869	967	115	147	253	215	169
CT LITCHFIELD													
1974	135	365	84	97	72	33	109	123	9	18	3	23	13
1985	135	445	96	124	81	37	124	138	12	20	3	29	18
1995	135	529	109	152	93	42	141	158	15	22	3	35	23
2005	135	606	119	178	103	47	158	176	17	24	3	40	28
2015	135	703	136	209	119	54	181	201	20	27	4	46	34
2025	135	768	146	231	129	59	196	218	22	30	4	51	38
CT NEW HAVEN													
1974	135	1870	437	496	357	158	546	611	49	95	13	116	69
1985	135	2228	491	618	398	176	609	678	59	101	14	141	91
1995	135	2557	535	730	439	194	672	746	70	107	15	163	111
2005	135	2869	575	837	480	212	735	815	81	116	16	184	132
2015	135	3150	617	931	519	229	794	881	91	126	17	203	150
2025	135	3399	654	1014	554	245	848	939	99	133	18	219	165
DE TOTAL													
1974		931	217	237	172	72	260	304	26	46	7	55	33
1985		1135	249	302	196	82	297	344	31	50	7	69	45
1995		1348	281	369	224	93	338	392	38	55	8	83	57
2005		1545	308	433	249	104	377	436	44	61	9	95	69
2015		1719	335	489	273	114	413	478	51	67	9	106	80
2025		1860	357	535	292	122	442	510	55	71	10	115	88
DE NEW CASTLE													
1974	150	931	217	237	172	72	260	304	26	46	7	55	33
1985	150	1135	249	302	196	82	297	344	31	50	7	69	45
1995	150	1348	281	369	224	93	338	392	38	55	8	83	57
2005	150	1545	308	433	249	104	377	436	44	61	9	95	69
2015	150	1719	335	489	273	114	413	478	51	67	9	106	80
2025	150	1860	357	535	292	122	442	510	55	71	10	115	88

TABLE 4.A.30e--ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--LOW POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM-MING	PICNIC-KING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
TOTAL SERVICE AREA													
1974		94642	28878	28771	21477	8490	31220	30994	3963	6022	1615	6190	3636
1985		104920	30148	33108	22248	8815	32380	31930	4419	5932	1559	7070	4400
1995		114257	31155	36948	23275	9202	33771	33256	4930	5998	1571	7702	5166
2005		122297	31893	40358	24216	9575	35111	34516	5396	6218	1629	8445	5800
2015		129507	32900	43340	25186	9959	36488	35851	5846	6467	1688	9009	6400
2025		136104	33961	45995	26170	10347	37877	37176	6232	6684	1735	9533	7000
PA TOTAL													
1974		20975	6381	6029	4915	2000	7157	7223	835	1351	388	1407	799
1985		23082	6557	6872	5028	2047	7323	7345	889	1306	366	1588	962
1995		25416	6786	7778	5258	2141	7653	7663	996	1326	370	1775	1138
2005		27194	6928	8505	5448	2218	7925	7920	1082	1372	382	1925	1300
2015		28914	7128	9218	5647	2299	8210	8196	1188	1423	394	2066	1462
2025		30619	7373	9906	5883	2395	8542	8517	1290	1476	406	2206	1613
PA BERKS													
1974	115	813	215	227	177	79	267	284	24	46	83	51	28
1985	115	907	221	265	181	81	274	289	26	45	79	58	36
1995	115	988	227	298	188	84	283	299	30	45	79	64	42
2005	115	1061	232	330	195	87	294	310	33	47	81	69	49
2015	115	1117	237	354	201	90	303	320	36	48	83	73	54
2025	115	1166	243	373	207	93	312	329	38	49	85	76	58
PA BRADFORD													
1974	135	126	34	32	28	13	43	48	4	7	1	8	4
1985	135	141	35	37	29	13	44	49	4	7	1	9	5
1995	135	155	35	42	29	14	45	50	4	7	1	10	6
2005	135	166	36	47	30	14	47	52	5	7	1	11	7
2015	135	176	36	50	31	14	48	53	5	8	1	11	8
2025	135	183	37	53	32	15	49	54	5	8	1	12	8
PA BUCKS													
1974	100	1511	447	463	355	139	487	535	59	103	16	93	54
1985	100	1710	476	553	376	147	516	563	69	102	16	107	69
1995	100	1911	509	637	404	158	554	605	81	107	16	120	83
2005	100	2093	534	714	433	170	594	647	90	114	17	132	96
2015	100	2261	565	780	462	181	635	691	99	121	18	143	107
2025	100	2411	595	838	490	192	673	731	107	128	19	153	116
PA CARBON													
1974	50	237	110	78	81	32	111	95	15	21	5	19	8
1985	50	268	113	91	83	32	113	96	16	20	5	22	10
1995	50	300	116	105	86	34	118	100	17	21	5	25	12
2005	50	327	119	118	89	35	122	103	19	21	5	27	14
2015	50	354	122	131	92	36	126	107	22	22	5	30	17
2025	50	377	126	143	95	37	131	111	24	23	5	32	19
PA CENTRE													
1974	200	180	42	38	30	14	50	58	5	7	1	11	6
1985	200	197	42	43	30	14	50	57	5	7	1	12	7
1995	200	214	43	48	31	14	52	59	5	7	1	13	8
2005	200	228	43	53	31	14	53	60	5	7	1	14	9
2015	200	237	43	56	32	15	53	61	6	7	1	15	10
2025	200	245	43	59	32	15	54	62	6	7	1	15	11
PA CHESTER													
1974	140	725	166	191	136	58	202	237	20	37	5	45	28
1985	140	842	181	232	148	63	220	256	23	38	5	53	36
1995	140	961	197	272	162	70	241	281	27	41	6	61	44
2005	140	1077	213	312	178	77	265	308	32	45	6	69	52
2015	140	1189	230	348	194	83	289	336	35	49	7	76	59
2025	140	1300	248	383	211	91	314	365	39	53	7	83	65
PA CLINTON													
1974	175	70	17	16	14	6	23	25	2	3	0	4	2
1985	175	76	17	18	14	6	22	24	2	3	0	5	3
1995	175	81	17	20	13	6	22	24	2	3	0	5	3
2005	175	82	17	20	13	6	22	24	2	3	0	5	3
2015	175	84	16	21	13	6	22	24	2	3	0	5	3
2025	175	85	16	22	13	6	21	23	2	3	0	6	4
PA COLUMBIA													
1974	100	164	56	48	45	19	64	67	7	12	2	10	5
1985	100	182	56	56	45	19	64	66	7	12	2	11	6
1995	100	199	56	63	46	19	65	67	7	11	2	13	7
2005	100	214	56	70	47	19	67	68	8	12	2	14	9
2015	100	226	57	75	47	20	68	69	9	12	2	14	10
2025	100	234	57	80	48	20	69	70	9	12	2	15	10
PA HARRISBURG SMSA													
1974	162	903	210	220	168	75	265	298	23	43	6	55	32
1985	162	998	216	253	172	77	272	303	25	41	6	62	39
1995	162	1092	223	285	179	80	283	315	28	42	6	69	45
2005	162	1170	228	313	186	83	294	327	30	43	6	74	51
2015	162	1246	235	340	193	86	305	339	33	45	6	79	58
2025	162	1304	240	361	199	89	314	349	36	46	6	83	62
PA LACKAWANNA													
1974	60	987	387	334	297	115	415	388	50	79	13	60	29
1985	60	1079	384	379	294	113	411	382	50	74	12	67	35
1995	60	1155	379	417	294	113	411	381	54	72	12	72	41
2005	60	1211	375	450	294	113	411	381	58	72	12	77	47
2015	60	1251	372	476	293	113	410	380	62	72	12	79	51
2025	60	1284	371	496	295	114	413	381	65	72	11	82	55

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TABLE 4.A.18a—ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE,
12 ACTIVITIES, 1,974 - 2,025—LOW POPULATION GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA LANCASTER													
1974	170	680	157	160	122	57	201	220	17	31	4	42	23
1985	170	769	165	189	128	60	211	230	19	30	4	49	28
1995	170	877	178	222	139	65	229	249	22	32	4	56	34
2005	170	948	183	245	146	68	239	260	24	33	4	61	39
2015	170	1013	189	268	152	71	249	271	26	35	5	65	44
2025	170	1065	194	286	157	74	258	288	28	36	5	69	48
PA LEBANON													
1974	132	241	61	62	50	23	78	86	6	13	2	15	8
1985	132	262	61	71	50	23	78	86	7	13	2	17	10
1995	132	285	63	79	52	24	81	88	7	13	2	19	11
2005	132	301	63	86	53	25	82	90	8	13	2	20	13
2015	132	315	63	93	54	25	83	91	9	13	2	21	14
2025	132	326	64	97	55	25	85	92	9	13	2	21	15
PA LEHIGH & NORTHAMPTON													
1974	50	2339	1051	782	759	290	1025	898	153	200	52	180	84
1985	50	2650	1102	917	792	303	1070	932	165	205	50	217	104
1995	50	2965	1149	1053	835	319	1128	982	184	210	51	245	125
2005	50	3253	1195	1183	880	337	1189	1034	204	221	54	271	146
2015	50	3533	1249	1314	926	354	1251	1088	229	233	57	295	168
2025	50	3783	1298	1430	969	371	1310	1137	250	242	58	317	187
PA LUZERNE													
1974	70	1321	506	437	348	154	554	516	63	103	17	81	40
1985	70	1442	499	495	381	152	545	505	64	96	15	91	49
1995	70	1557	497	550	383	152	548	507	69	93	15	99	57
2005	70	1632	491	595	383	152	547	506	75	94	15	104	66
2015	70	1687	488	628	383	152	548	507	80	94	15	108	71
2025	70	1719	485	649	383	152	547	505	83	93	15	110	75
PA LYCOMING													
1974	150	240	61	60	49	23	78	86	7	13	2	15	8
1985	150	261	60	68	48	22	77	84	7	12	2	16	9
1995	150	279	59	75	48	22	77	84	7	11	2	18	11
2005	150	293	58	81	48	22	77	84	8	11	2	19	13
2015	150	301	58	85	48	22	77	83	8	11	2	19	14
2025	150	304	57	87	48	22	77	83	9	11	2	20	14
PA MONROE													
1974	15	493	224	98	157	70	225	127	58	58	37	97	63
1985	15	570	238	116	166	74	239	133	61	56	37	114	78
1995	15	662	254	138	179	80	257	144	68	61	38	134	97
2005	15	761	270	162	193	86	277	155	74	65	41	156	119
2015	15	852	288	165	207	92	297	166	83	70	44	176	141
2025	15	952	307	211	223	99	321	179	94	75	46	198	167
PA MONTGOMERY													
1974	100	2209	617	696	502	197	695	747	84	136	21	137	83
1985	100	2231	592	735	479	188	664	709	88	123	19	140	93
1995	100	2605	664	880	542	213	751	801	107	135	20	165	115
2005	100	2712	681	919	565	222	783	834	109	141	21	172	120
2015	100	2878	704	990	589	231	816	869	119	147	22	183	133
2025	100	3408	821	1185	691	271	958	1019	144	171	25	216	161
PA MONTOUR													
1974	110	46	14	13	12	5	17	18	2	3	9	3	2
1985	110	48	13	14	11	5	16	17	2	3	8	3	2
1995	110	52	13	16	11	5	16	17	2	3	8	3	2
2005	110	51	12	16	10	5	16	16	2	2	7	3	2
2015	110	53	12	17	10	5	16	16	2	2	7	4	2
2025	110	55	12	18	11	5	16	16	2	2	7	4	3
PA NORTHUMBERLAND													
1974	135	202	56	51	48	22	75	81	6	12	2	13	6
1985	135	226	56	59	47	22	74	79	6	11	1	14	8
1995	135	248	56	67	47	22	75	80	6	11	1	16	9
2005	135	265	56	74	48	23	75	81	7	11	1	17	11
2015	135	278	56	80	48	23	76	81	7	11	1	18	12
2025	135	286	55	83	48	23	76	81	8	11	1	19	13
PA PHILADELPHIA & DELAWARE													
1974	120	5831	1458	1576	1121	445	1711	1860	161	317	45	332	209
1985	120	6453	1513	1807	1157	459	1767	1909	174	310	43	377	253
1995	120	6858	1515	1970	1172	465	1789	1929	188	303	42	406	286
2005	120	7188	1513	2109	1188	471	1814	1954	199	306	42	429	316
2015	120	7513	1529	2247	1209	479	1846	1988	214	312	43	451	347
2025	120	7609	1511	2305	1203	477	1837	1976	221	309	42	458	363
PA PIKE													
1974	15	144	57	30	42	19	60	33	15	14	9	29	20
1985	15	171	61	36	45	20	65	36	17	14	9	35	26
1995	15	199	66	44	49	22	71	39	19	15	9	42	33
2005	15	226	71	51	54	24	77	42	22	16	10	48	40
2015	15	255	76	58	58	26	84	46	26	17	10	54	48
2025	15	286	83	67	64	29	92	51	29	19	11	61	55
PA SCHUYLKILL													
1974	105	513	138	158	111	49	168	167	17	29	42	33	19
1985	105	431	140	127	112	49	169	167	15	27	40	27	14
1995	105	462	141	137	114	50	172	170	15	27	40	29	15
2005	105	495	140	149	116	51	175	172	15	27	39	32	17
2015	105	534	141	165	118	52	178	175	17	28	40	34	20
2025	105	607	141	201	120	53	180	177	21	28	40	40	27

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TABLE 4.A.18a—ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025—LOW POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM-MING	PICNIC-KING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	BICYCL SHOWN	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
PA SNYDER													
1974	165	60	15	14	12	6	20	22	2	3	0	4	2
1985	165	70	16	17	13	6	20	23	2	3	0	4	3
1995	165	80	17	20	14	6	22	24	2	3	0	5	3
2005	165	90	18	24	15	7	23	26	2	3	0	6	4
2015	165	99	19	26	16	7	25	28	3	4	0	6	4
2025	165	104	19	28	16	7	25	28	3	4	0	7	5
PA SULLIVAN													
1974	140	12	3	3	3	1	4	5	0	1	0	1	0
1985	140	13	3	3	3	1	4	5	0	1	0	1	0
1995	140	14	3	4	3	1	4	5	0	1	0	1	1
2005	140	13	3	3	2	1	4	4	0	1	0	1	1
2015	140	13	3	4	2	1	4	4	0	1	0	1	1
2025	140	14	3	4	2	1	4	4	0	1	0	1	1
PA SUSQUEHANNA													
1974	95	110	39	33	31	13	44	45	5	9	1	7	3
1985	95	123	40	39	31	13	44	45	5	8	1	8	4
1995	95	144	43	46	34	14	48	49	6	9	1	9	5
2005	95	163	46	54	37	15	53	54	7	9	1	10	7
2015	95	182	49	62	40	16	57	58	7	10	2	12	8
2025	95	200	52	69	43	17	61	62	8	11	2	13	9
PA UNION													
1974	135	66	18	17	14	6	22	25	2	4	1	4	2
1985	135	77	19	21	15	7	23	26	2	4	1	5	3
1995	135	85	19	23	16	7	24	28	2	4	1	5	3
2005	135	93	20	26	17	8	25	29	2	4	1	6	4
2015	135	99	20	28	17	8	26	30	3	4	1	6	4
2025	135	102	20	30	17	8	26	30	3	4	1	7	5
PA WAYNE													
1974	40	166	86	55	61	24	82	66	13	16	5	16	7
1985	40	191	89	66	63	25	85	68	14	16	5	19	8
1995	40	218	92	77	66	26	89	72	16	16	5	22	10
2005	40	252	100	92	73	28	98	78	19	18	5	25	13
2015	40	287	109	106	80	31	107	86	22	19	6	29	16
2025	40	281	104	106	76	29	103	82	22	18	5	29	16
PA WYOMING													
1974	85	68	26	21	20	8	28	29	3	6	1	4	2
1985	85	79	27	26	22	8	30	30	4	6	1	5	3
1995	85	88	28	29	22	9	31	31	4	6	1	6	3
2005	85	96	29	33	23	9	32	32	4	6	1	6	4
2015	85	102	29	36	24	9	32	33	5	6	1	6	4
2025	85	110	30	39	25	10	34	35	5	6	1	7	5
PA YORK													
1974	195	518	111	113	85	39	142	159	12	18	3	32	17
1985	195	614	122	139	93	43	156	174	13	19	3	38	22
1995	195	683	128	160	99	45	165	184	15	20	3	43	26
2005	195	734	131	176	103	47	172	191	17	20	3	47	30
2015	195	780	135	191	107	49	179	198	19	21	3	50	34
2025	195	819	139	204	110	50	185	205	20	22	3	52	37
NJ TOTAL													
1974		27266	8983	8929	6766	2503	9230	9212	1327	1906	499	1842	1066
1985		31184	9723	10604	7270	2697	9927	9794	1570	1948	507	2210	1385
1995		33957	10140	11833	7652	2841	10446	10281	1763	1990	518	2415	1579
2005		36754	10512	13060	8053	2993	10994	10797	1972	2089	546	2668	1847
2015		39225	10963	14094	8479	3155	11575	11353	2153	2200	575	2870	2043
2025		41558	11472	15031	8910	3318	12162	11908	2304	2301	600	3064	2214
NJ BERGEN													
1974	70	4244	1358	1492	1072	392	1428	1451	200	289	47	264	168
1985	70	4601	1416	1683	1110	406	1479	1496	226	284	45	290	191
1995	70	4952	1468	1855	1161	425	1546	1562	254	289	45	313	216
2005	70	5268	1515	2003	1215	445	1618	1633	274	302	47	334	238
2015	70	5562	1575	2133	1271	465	1694	1709	294	317	49	353	257
2025	70	5836	1633	2251	1326	486	1767	1782	309	329	51	371	273
NJ ESSEX													
1974	75	3434	1179	1166	849	266	1131	1149	166	246	40	191	121
1985	75	4010	1295	1409	929	291	1237	1249	192	254	41	229	153
1995	75	4270	1305	1536	945	296	1258	1269	207	250	40	246	172
2005	75	4470	1308	1638	962	301	1281	1289	218	253	40	260	189
2015	75	4619	1314	1716	976	305	1299	1306	229	255	40	270	202
2025	75	4751	1324	1782	990	310	1317	1324	237	258	41	279	212
NJ HUDSON													
1974	85	2204	753	714	513	215	798	704	96	149	25	132	76
1985	85	2426	768	816	522	218	812	712	103	143	24	140	90
1995	85	2656	788	918	542	227	843	738	114	144	24	164	105
2005	85	2867	810	1016	564	236	876	764	127	149	24	176	121
2015	85	3031	829	1094	581	243	902	789	138	154	25	189	136
2025	85	3167	846	1158	596	249	927	809	147	157	25	198	144
NJ HUNTERDON													
1974	45	440	186	151	133	50	174	152	31	37	10	48	19
1985	45	509	202	184	144	54	189	164	37	37	10	47	25
1995	45	588	222	219	160	59	209	181	44	40	11	54	31
2005	45	668	243	254	177	66	232	201	52	45	12	62	37
2015	45	748	266	288	196	73	256	222	59	50	14	69	43
2025	45	829	291	322	215	80	282	244	66	54	15	77	48

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TABLE 4.A.18a--ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--LOW POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	BCYCL SHOWN	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ MERCER													
1974	80	1274	420	425	323	110	426	448	58	91	14	79	49
1985	80	1454	450	508	344	117	453	474	67	92	14	87	57
1995	80	1640	481	589	372	126	489	512	78	96	15	99	68
2005	80	1821	511	668	402	137	529	552	88	103	16	111	80
2015	80	1998	548	743	434	148	571	596	99	111	17	122	90
2025	80	2169	585	813	467	159	614	640	108	118	18	133	100
NJ MIDDLESEX													
1974	80	2501	819	833	627	231	837	880	114	181	29	152	99
1985	80	2780	862	976	654	241	873	914	132	179	28	172	112
1995	80	3054	906	1105	693	255	926	968	153	185	29	191	131
2005	80	3296	941	1217	734	270	980	1023	169	194	30	206	149
2015	80	3527	991	1316	778	286	1039	1084	184	206	32	221	163
2025	80	3761	1044	1412	825	303	1101	1148	197	217	33	236	176
NJ MONMOUTH													
1974	115	1349	345	387	284	117	406	461	43	78	141	83	52
1985	115	1482	357	443	292	120	419	472	48	76	134	93	63
1995	115	1629	374	500	309	127	442	498	54	78	137	103	74
2005	115	1762	388	552	326	134	467	526	60	82	144	112	84
2015	115	1884	406	597	343	141	492	553	65	86	150	120	92
2025	115	1994	423	637	360	148	516	580	69	90	156	127	99
NJ MORRIS													
1974	60	1993	675	712	519	184	672	695	103	146	24	122	73
1985	60	2253	727	848	555	197	719	740	123	148	24	140	93
1995	60	2509	779	966	601	213	778	800	144	155	25	156	109
2005	60	2693	815	1052	639	226	828	850	156	165	27	168	121
2015	60	2916	871	1146	680	244	892	915	170	178	28	183	133
2025	60	3139	930	1238	739	262	957	982	182	190	30	197	144
NJ OCEAN													
1974	125	605	153	162	133	60	200	223	16	33	4	38	21
1985	125	709	163	198	142	64	214	237	19	33	4	45	27
1995	125	745	160	214	141	63	212	234	20	32	4	48	31
2005	125	816	165	241	148	66	222	246	22	33	4	53	36
2015	125	889	174	267	157	70	236	261	25	35	5	58	41
2025	125	948	182	288	169	74	248	274	27	37	5	62	45
NJ PASSAIC													
1974	50	2470	1011	851	710	255	949	837	158	196	50	194	98
1985	50	2753	1056	985	741	266	990	870	175	196	49	221	120
1995	50	3008	1097	1107	776	279	1037	909	197	198	49	244	139
2005	50	3252	1142	1221	815	293	1089	955	218	208	51	265	150
2015	50	3486	1190	1332	857	308	1145	1003	240	219	54	284	.178
2025	50	3702	1239	1429	898	323	1200	1050	258	228	55	303	193
NJ PHILADELPHIA SMSA-NJ													
1974	125	2272	552	612	451	191	665	772	64	126	17	138	86
1985	125	2792	633	791	515	218	759	876	79	136	18	174	115
1995	125	3114	671	908	550	233	810	935	92	141	19	195	130
2005	125	3411	704	1018	588	248	866	997	103	150	20	215	160
2015	125	3683	745	1113	627	265	923	1062	113	160	21	233	177
2025	125	3954	788	1204	667	282	982	1130	122	170	22	250	194
NJ SALEM													
1974	165	133	30	32	25	10	37	44	3	6	1	8	5
1985	165	148	31	38	25	10	38	45	4	6	1	9	6
1995	165	165	33	43	27	11	40	48	4	6	1	10	7
2005	165	179	34	48	28	11	43	50	5	6	1	11	8
2015	165	194	36	53	30	12	45	53	5	7	1	12	9
2025	165	209	38	58	32	13	48	56	6	7	1	13	10
NJ SOMERSET													
1974	60	1032	349	368	269	94	348	361	53	73	12	63	37
1985	60	1136	367	425	281	99	364	375	61	74	12	70	46
1995	60	1240	387	476	298	105	386	397	70	77	12	77	53
2005	60	1326	401	517	315	110	407	418	76	81	13	83	59
2015	60	1410	421	554	333	117	431	442	81	85	14	88	64
2025	60	1479	443	577	352	124	456	468	83	90	14	92	66
NJ SUSSEX													
1974	20	413	175	107	118	50	162	106	48	40	22	76	40
1985	20	958	378	261	254	108	349	226	110	81	43	179	104
1995	20	933	409	240	277	118	381	246	105	86	45	171	85
2005	20	1219	437	352	300	128	414	267	150	93	49	231	151
2015	20	1340	470	393	325	138	448	289	169	102	53	254	172
2025	20	1466	506	434	353	150	486	313	186	109	57	279	192
NJ UNION													
1974	85	2178	667	729	530	189	706	742	93	142	23	132	81
1985	85	2310	673	806	531	190	708	741	102	135	21	143	95
1995	85	2453	684	878	545	195	727	759	112	134	21	152	106
2005	85	2555	687	931	558	199	743	775	119	136	21	159	116
2015	85	2629	696	967	568	203	757	789	124	139	21	164	122
2025	85	2694	704	997	578	206	770	802	128	140	21	169	127
NJ WARREN													
1974	20	725	311	187	210	91	296	187	80	71	38	133	67
1985	20	863	343	233	230	100	325	204	94	73	39	162	90
1995	20	1006	376	281	256	111	361	226	113	79	42	190	113
2005	20	1152	410	331	283	123	399	249	135	87	46	219	140
2015	20	1307	452	382	315	136	444	277	158	97	50	249	166
2025	20	1461	496	432	347	150	490	306	179	106	55	279	190

IOE ASSOCIATES, INC.

TABLE 4.A.10a—ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE,
12 ACTIVITIES, 1,974 - 2,025—LOW POPULATION GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY TOTAL													
1974		40936	12215	12311	8732	3531	13243	12770	1645	2480	401	2604	1569
1985		44666	12522	13915	8984	3601	13496	12956	1786	2401	458	2903	1880
1995		48367	12834	15423	9217	3728	13960	13392	1977	2400	459	3178	2158
2005		51393	13022	16711	9518	3850	14406	13800	2131	2466	474	3408	2416
2015		54040	13313	17811	9817	3971	14847	14223	2278	2541	489	3605	2630
2025		56273	13599	18727	10091	4082	15291	14602	2400	2596	501	3773	2806
NY ALBANY SMSA													
1974	145	1718	401	442	319	150	514	551	45	84	12	107	61
1985	145	1919	419	515	332	156	534	570	50	83	12	122	76
1995	145	2080	430	574	344	162	553	590	56	83	12	133	88
2005	145	2211	436	626	354	166	570	607	61	85	12	142	100
2015	145	2305	442	664	362	170	583	620	65	87	12	149	108
2025	145	2367	444	689	367	172	591	628	68	88	12	153	114
NY BROOME & TIOGA													
1974	125	647	161	173	132	61	205	224	18	36	5	41	23
1985	125	698	161	196	132	61	204	222	19	34	5	45	28
1995	125	743	163	214	134	62	207	225	21	33	4	48	32
2005	125	775	162	229	135	63	209	227	22	34	5	50	35
2015	125	800	163	240	137	64	212	230	24	34	5	52	38
2025	125	815	163	247	137	64	213	231	24	34	5	53	39
NY CHENANGO													
1974	175	90	21	21	18	8	28	32	2	4	1	6	3
1985	175	100	22	24	18	8	28	32	2	4	1	6	4
1995	175	108	22	27	18	8	28	33	3	4	1	7	4
2005	175	116	22	30	19	8	29	34	3	4	1	8	5
2015	175	120	22	31	19	8	29	34	3	4	1	8	5
2025	175	123	22	33	19	9	30	34	3	4	1	8	6
NY COLUMBIA													
1974	135	124	31	32	27	12	41	45	3	7	1	8	4
1985	135	137	32	37	27	12	41	45	4	6	1	9	5
1995	135	153	33	43	28	13	43	47	4	7	1	10	6
2005	135	167	34	48	29	13	45	49	4	7	1	11	7
2015	135	178	35	52	30	14	47	51	5	7	1	12	8
2025	135	186	36	56	31	14	49	53	5	7	1	12	9
NY DELAWARE													
1974	145	97	25	24	21	10	33	36	3	5	1	6	3
1985	145	108	26	28	21	10	34	37	3	5	1	7	4
1995	145	120	27	32	22	10	35	38	3	5	1	8	5
2005	145	130	27	35	23	11	37	40	3	5	1	8	5
2015	145	140	28	39	24	11	38	41	4	6	1	9	6
2025	145	149	29	42	25	12	39	43	4	6	1	10	7
NY DUTCHESS													
1974	95	784	248	243	195	74	260	285	32	54	9	48	27
1985	95	888	263	288	206	78	282	298	36	54	8	55	34
1995	95	1004	280	338	221	84	302	320	43	56	9	63	42
2005	95	1105	295	380	237	90	324	342	47	60	9	69	49
2015	95	1198	311	419	251	96	344	363	53	64	10	76	55
2025	95	1289	328	456	267	102	366	386	58	67	10	81	61
NY GREENE													
1974	105	103	32	31	27	11	39	40	4	7	10	6	3
1985	105	117	33	36	28	11	40	41	4	7	10	7	4
1995	105	133	35	42	29	12	42	44	5	7	10	8	5
2005	105	147	36	48	31	13	45	46	5	7	11	9	6
2015	105	157	37	52	32	13	46	48	6	8	11	10	7
2025	105	164	38	55	33	14	47	49	6	8	11	11	8
NY NASSAU & SUFFOLK													
1974	160	6222	1314	1599	1069	469	1641	1909	165	275	38	389	252
1985	160	6785	1373	1823	1110	487	1705	1971	188	268	36	430	304
1995	160	7371	1441	2028	1170	514	1798	2078	214	277	37	469	348
2005	160	7878	1493	2198	1234	542	1895	2187	230	292	39	503	385
2015	160	8331	1557	2341	1295	569	1990	2297	246	308	41	532	414
2025	160	8740	1617	2468	1353	594	2078	2397	258	320	43	559	439
NY NEW YORK CITY													
1974	100	23556	7354	7307	4988	1993	7821	7181	924	1452	238	1353	829
1985	100	25544	7456	8173	5025	2008	7879	7198	980	1395	225	1490	977
1995	100	27484	7538	8991	5133	2051	8048	7341	1060	1370	219	1628	1108
2005	100	29006	7554	9690	5229	2089	8200	7462	1129	1389	222	1733	1234
2015	100	30307	7625	10285	5324	2127	8348	7590	1196	1408	224	1821	1340
2025	100	31346	7700	10760	5409	2161	8481	7702	1252	1422	224	1891	1425
NY ORANGE													
1974	25	1852	853	537	561	225	770	532	193	179	85	279	140
1985	25	2097	895	636	585	235	804	552	215	177	82	323	177
1995	25	2354	946	736	624	251	857	588	249	183	84	365	214
2005	25	2591	989	832	664	267	913	625	281	194	89	404	251
2015	25	2802	1039	914	704	283	967	662	310	205	94	439	282
2025	25	2991	1089	985	742	298	1019	697	334	215	98	469	309
NY OTSEGO													
1974	100	107	25	25	20	9	33	36	3	5	1	7	4
1985	100	121	26	29	21	10	34	37	3	5	1	8	5
1995	100	135	27	33	21	10	35	39	3	5	1	9	5
2005	100	144	27	37	22	10	36	40	4	5	1	9	6
2015	100	152	28	39	23	11	37	40	4	5	1	10	7
2025	100	159	28	42	23	11	38	41	4	5	1	10	8

IDE ASSOCIATES, INC.

TABLE 4.A.10a--ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--LOW POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	BCYCL SHOWN	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY PUTNAM													
1974	105	206	58	62	47	19	66	72	8	13	19	13	8
1985	105	243	65	77	52	21	73	79	9	13	20	16	10
1995	105	283	72	93	58	24	82	89	11	15	21	18	13
2005	105	321	79	107	65	27	91	99	13	16	24	21	15
2015	105	364	88	123	73	30	102	111	15	18	27	23	18
2025	105	410	98	139	82	33	114	124	17	20	29	26	20
NY ROCKLAND & WESTCHESTER													
1974	90	4446	1307	1489	1020	380	1393	1452	192	279	45	275	178
1985	90	4810	1354	1676	1049	392	1434	1487	216	272	43	301	211
1995	90	5177	1406	1843	1098	410	1501	1555	241	275	43	325	237
2005	90	5471	1439	1973	1145	427	1565	1618	256	285	44	345	259
2015	90	5757	1492	2090	1195	446	1633	1689	270	299	46	363	277
2025	90	5998	1542	2187	1239	462	1693	1750	282	308	48	379	291
NY SCHOHARIE													
1974	155	59	15	15	13	6	20	22	2	3	0	4	2
1985	155	71	16	18	14	6	22	24	2	3	0	5	3
1995	155	84	18	22	15	7	24	26	2	4	0	5	3
2005	155	94	19	25	16	7	25	28	2	4	1	6	4
2015	155	93	19	24	17	8	26	29	2	4	1	6	4
2025	155	105	20	29	17	8	27	30	3	4	1	7	5
NY SULLIVAN													
1974	45	294	139	99	99	37	132	112	21	27	8	26	11
1985	45	324	143	112	102	38	136	114	22	26	7	29	14
1995	45	361	149	128	107	40	143	119	25	26	7	33	16
2005	45	390	152	141	111	41	149	124	27	27	7	35	19
2015	45	420	158	155	116	43	155	130	29	29	8	38	21
2025	45	450	164	168	122	45	163	136	32	30	8	41	23
NY ULSTER													
1974	70	630	231	212	178	66	240	241	31	50	8	38	21
1985	70	699	238	244	183	68	247	247	34	49	8	43	26
1995	70	778	249	279	193	71	261	260	38	50	8	49	31
2005	70	848	258	312	203	75	274	273	42	52	8	53	35
2015	70	915	269	342	214	79	288	287	47	55	9	58	40
2025	70	978	281	371	225	83	303	302	51	57	9	62	44
CT TOTAL													
1974		4535	1082	1265	892	384	1325	1486	130	238	240	283	175
1985		4955	1118	1441	917	395	1363	1520	145	232	221	315	212
1995		5370	1156	1600	957	413	1424	1586	163	234	217	344	243
2005		5704	1181	1731	995	429	1480	1646	175	242	219	367	270
2015		5980	1213	1833	1029	445	1533	1704	187	251	222	385	291
2025		6210	1240	1916	1059	458	1579	1753	194	256	221	400	307
CT FAIRFIELD													
1974	115	2300	560	672	464	194	670	752	72	125	224	144	93
1985	115	2410	559	735	460	192	665	743	78	117	206	153	108
1995	115	2521	562	786	467	195	674	752	84	115	201	161	119
2005	115	2597	560	823	473	198	683	761	88	116	202	166	127
2015	115	2649	562	847	478	200	690	769	90	118	204	170	132
2025	115	2682	562	862	481	201	695	773	92	118	203	172	135
CT LITCHFIELD													
1974	135	365	84	97	72	33	109	123	9	18	3	23	13
1985	135	432	93	120	79	36	120	134	11	19	3	28	18
1995	135	488	100	140	86	39	130	145	13	20	3	32	21
2005	135	535	105	157	91	42	139	155	15	21	3	35	25
2015	135	569	110	170	96	44	146	163	16	22	3	37	27
2025	135	591	112	177	99	45	151	168	17	23	3	39	29
CT NEW HAVEN													
1974	135	1870	437	496	357	158	546	611	49	95	13	116	69
1985	135	2113	465	586	378	167	578	643	56	95	13	134	86
1995	135	2361	494	674	405	179	620	689	65	99	14	151	103
2005	135	2572	516	750	431	190	659	730	72	104	14	165	118
2015	135	2762	541	817	455	201	696	772	80	111	15	178	131
2025	135	2937	566	877	479	212	733	812	85	115	16	189	142
DE TOTAL													
1974		931	217	237	172	72	260	304	26	46	7	55	33
1985		1035	227	275	179	74	271	314	28	46	6	63	41
1995		1147	239	314	190	79	288	333	32	47	7	70	48
2005		1251	250	351	202	84	306	353	36	50	7	77	56
2015		1348	263	384	214	89	324	375	40	53	7	83	62
2025		1443	277	415	227	94	343	396	43	55	8	89	68
DE NEW CASTLE													
1974	150	931	217	237	172	72	260	304	26	46	7	55	33
1985	150	1035	227	275	179	74	271	314	28	46	6	63	41
1995	150	1147	239	314	190	79	288	333	32	47	7	70	48
2005	150	1251	250	351	202	84	306	353	36	50	7	77	56
2015	150	1348	263	384	214	89	324	375	40	53	7	83	62
2025	150	1443	277	415	227	94	343	396	43	55	8	89	68

IDE ASSOCIATES, INC.

TABLE 4.A.10b--ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE,
12 ACTIVITIES, 1,974 - 2,025--HIGH POPULATION GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	BCYCL SHOWN	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
TOTAL SERVICE AREA													
1974		94662	20876	26771	21477	8478	31201	30994	3963	6022	1614	6107	3636
1985		112919	32929	35587	24106	9517	34917	34411	4817	6615	1736	7729	4882
1995		129573	35525	41799	26609	10537	38457	37796	5724	6870	1898	9056	5990
2005		145643	38255	47951	29150	11569	42035	41200	6655	7506	2110	10438	7268
2015		160270	41081	51626	31581	12522	45465	44508	7561	8137	2315	11661	8306
2025		173541	43728	58336	33053	13629	48648	47545	8308	8677	2490	12782	9388
PA TOTAL													
1974		20975	6378	6029	4915	1988	7138	7223	835	1351	387	1604	795
1985		25132	7188	7478	5506	2244	8008	7992	987	1433	407	1759	1067
1995		28910	7658	8673	5928	2422	8623	8562	1150	1503	435	2059	1329
2005		32018	8226	9910	6659	2643	9387	9269	1322	1638	481	2378	1622
2015		35493	8855	11194	7002	2869	10167	9980	1551	1781	529	2705	1937
2025		38645	9391	12263	7465	3062	10833	10564	1718	1894	569	2999	2227
PA BERKS													
1974	115	813	219	227	177	79	267	284	24	46	83	51	28
1985	115	951	232	278	190	85	287	303	27	47	83	61	38
1995	115	1069	246	323	203	91	307	326	32	49	85	69	46
2005	115	1182	258	367	217	97	327	345	37	52	90	77	55
2015	115	1284	273	406	231	103	348	367	42	55	96	84	62
2025	115	1383	288	442	245	110	370	390	45	59	101	90	68
PA BRADFORD													
1974	135	176	34	32	28	13	43	48	4	7	1	8	4
1985	135	157	39	42	32	15	49	55	4	8	1	10	6
1995	135	190	43	52	36	17	56	62	5	9	1	12	7
2005	135	219	47	61	40	18	61	68	6	10	1	14	9
2015	135	244	50	70	43	20	66	73	7	10	1	16	11
2025	135	268	54	78	46	21	71	79	8	11	2	18	12
PA BUCKS													
1974	100	1511	447	463	355	139	487	535	59	103	16	93	54
1985	100	1865	518	603	410	161	562	614	75	111	17	117	76
1995	100	2205	587	735	466	183	640	698	93	123	19	139	96
2005	100	2583	659	881	534	210	733	798	112	141	22	163	119
2015	100	2940	734	1015	601	236	826	898	129	158	24	186	139
2025	100	3135	774	1089	637	250	874	950	139	166	25	199	150
PA CARBON													
1974	50	237	110	78	81	32	111	95	15	21	5	19	8
1985	50	300	126	102	92	36	127	108	18	23	6	25	11
1995	50	353	137	123	101	39	139	118	21	24	6	29	14
2005	50	416	150	150	113	44	155	131	25	27	7	35	18
2015	50	486	168	180	126	49	173	147	30	30	7	41	23
2025	50	545	188	214	143	54	196	166	36	34	8	48	28
PA CENTRE													
1974	200	180	42	38	30	14	50	58	5	7	1	11	6
1985	200	215	46	47	33	15	55	63	5	8	1	13	8
1995	200	249	50	56	36	16	60	68	6	8	1	15	9
2005	200	280	53	65	39	18	65	74	7	8	1	18	11
2015	200	309	56	73	41	19	70	79	8	9	1	19	13
2025	200	334	59	80	44	20	74	84	8	10	1	21	14
PA CHESTER													
1974	140	725	166	191	136	58	202	237	20	37	5	45	28
1985	140	964	207	266	169	73	252	293	26	44	6	61	42
1995	140	1235	253	350	209	90	311	362	35	52	7	79	57
2005	140	1561	308	452	250	111	384	446	46	65	9	100	75
2015	140	1819	352	533	297	128	442	514	54	75	10	116	90
2025	140	2068	395	610	336	144	500	580	62	84	12	133	104
PA CLINTON													
1974	175	70	17	16	14	6	23	25	2	3	0	4	2
1985	175	82	19	20	15	7	24	26	2	3	0	5	3
1995	175	94	19	23	15	7	25	28	2	3	0	6	4
2005	175	99	20	24	16	8	27	29	2	4	1	6	4
2015	175	110	21	28	17	8	28	31	3	4	1	7	5
2025	175	122	22	32	18	9	30	33	3	4	1	8	5
PA COLUMBIA													
1974	100	164	56	48	45	19	64	67	7	12	2	10	5
1985	100	204	62	62	50	21	72	74	7	13	2	13	7
1995	100	232	65	73	53	22	76	78	8	13	2	15	8
2005	100	255	67	83	55	23	79	81	9	14	2	16	10
2015	100	277	69	92	58	24	83	85	11	14	2	18	12
2025	100	297	72	101	61	25	87	89	12	15	2	19	13
PA HARRISBURG SMSA													
1974	162	903	210	220	168	75	265	298	23	43	6	55	32
1985	162	1122	243	285	193	86	305	341	28	46	6	70	43
1995	162	1293	264	338	212	95	335	374	33	49	7	82	53
2005	162	1452	283	388	231	103	364	406	37	53	7	92	64
2015	162	1609	303	440	249	111	394	438	43	58	8	103	75
2025	162	1752	322	485	267	119	422	469	48	61	8	112	84
PA LACKAWANNA													
1974	60	987	387	334	297	115	415	388	50	79	13	68	29
1985	60	1121	399	393	305	118	427	396	52	77	12	70	37
1995	60	1224	402	442	312	120	436	404	57	76	12	77	43
2005	60	1315	407	489	319	123	446	413	63	78	13	83	51
2015	60	1392	414	530	326	126	457	423	69	80	13	88	57
2025	60	1452	419	561	333	129	466	431	74	81	13	92	62

IDE ASSOCIATES, INC.

TABLE 4.A.180--ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--HIGH POPULATION GROWTH SERIES
(ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA LANCASTER													
1974	170	680	157	160	122	57	201	220	17	31	4	42	23
1985	170	867	186	213	144	68	237	259	21	34	5	55	32
1995	170	1001	203	253	159	75	261	284	25	36	5	64	39
2005	170	1128	218	292	173	81	285	309	28	40	5	73	47
2015	170	1254	234	332	188	88	309	335	33	43	6	81	55
2025	170	1370	250	368	202	95	332	360	37	46	6	89	62
PA LEBANON													
1974	132	241	61	62	50	23	78	86	6	13	2	15	8
1985	132	295	69	80	57	26	88	96	8	14	2	19	11
1995	132	344	75	95	63	29	97	106	9	15	2	22	13
2005	132	391	81	112	69	32	106	116	10	16	2	26	16
2015	132	434	87	127	74	34	115	125	12	18	2	28	20
2025	132	474	93	141	80	37	123	135	14	19	3	31	22
PA LEHIGH & NORTHAMPTON													
1974	50	2339	1051	782	759	290	1025	898	153	208	52	188	84
1985	50	3040	1264	1052	908	347	1227	1069	189	235	58	249	119
1995	50	3241	1256	1151	913	349	1233	1073	201	229	56	268	136
2005	50	3696	1358	1344	1030	382	1351	1175	232	251	61	308	166
2015	50	4203	1486	1563	1102	421	1489	1294	272	277	67	351	200
2025	50	4628	1588	1749	1186	454	1602	1391	306	296	71	388	229
PA LUZERNE													
1974	70	1321	506	437	388	154	554	516	63	103	17	81	40
1985	70	1472	510	505	389	155	556	515	65	98	16	93	50
1995	70	1611	514	569	397	158	567	525	72	97	15	102	59
2005	70	1724	518	628	404	161	578	535	80	99	16	110	69
2015	70	1817	526	676	413	164	590	546	86	101	16	116	77
2025	70	1899	535	717	423	168	604	558	92	103	16	122	83
PA LYCOMING													
1974	150	240	61	60	49	23	78	86	7	13	2	15	8
1985	150	275	63	71	51	24	81	88	7	12	2	17	10
1995	150	309	65	83	53	25	85	92	8	13	2	20	12
2005	150	340	68	94	56	26	89	97	9	13	2	22	15
2015	150	366	70	104	59	27	94	101	10	14	2	23	16
2025	150	387	73	111	61	28	97	106	11	14	2	25	18
PA MONROE													
1974	15	493	224	98	157	70	225	127	58	58	37	97	63
1985	15	745	311	151	217	97	312	174	80	76	48	149	101
1995	15	1041	399	216	281	125	404	226	107	95	60	210	152
2005	15	1367	486	291	347	156	499	278	133	117	74	281	214
2015	15	1764	595	384	428	191	616	343	172	145	90	365	293
2025	15	2175	703	483	509	227	733	408	215	171	106	453	382
PA MONTGOMERY													
1974	100	2209	617	696	502	197	695	747	84	136	21	137	83
1985	100	2594	689	855	557	219	772	825	102	143	22	163	108
1995	100	2911	741	984	606	238	839	895	119	151	23	184	129
2005	100	3140	788	1063	654	257	907	966	126	163	24	199	139
2015	100	3395	831	1169	695	273	963	1025	141	173	26	215	157
2025	100	3609	870	1254	732	287	1014	1079	152	181	27	229	171
PA MONTOUR													
1974	110	46	14	13	12	5	17	18	2	3	9	3	2
1985	110	59	16	17	13	6	20	21	2	3	10	4	2
1995	110	70	18	21	15	7	22	23	2	4	10	5	3
2005	110	83	20	26	17	7	25	26	3	4	12	5	4
2015	110	94	22	30	18	8	27	28	3	4	13	6	4
2025	110	103	23	33	20	9	29	30	3	5	14	7	5
PA NORTHUMBERLAND													
1974	135	202	56	51	48	22	75	81	6	12	2	13	6
1985	135	244	60	64	51	24	80	86	6	12	2	16	8
1995	135	288	65	78	55	26	86	93	7	13	2	19	11
2005	135	326	68	91	59	28	92	99	8	13	2	21	13
2015	135	358	72	103	62	29	98	105	9	14	2	24	16
2025	135	386	75	113	65	31	103	110	10	15	2	25	17
PA PHILADELPHIA & DELAWARE													
1974	120	5831	1458	1576	1121	445	1711	1860	161	317	45	332	289
1985	120	6582	1543	1843	1180	468	1802	1947	178	316	44	385	290
1995	120	7057	1559	2027	1206	478	1841	1985	193	312	43	418	294
2005	120	7439	1565	2183	1229	487	1877	2022	206	317	44	444	327
2015	120	7743	1576	2316	1246	494	1902	2049	221	322	44	465	358
2025	120	7911	1571	2397	1251	496	1910	2054	230	321	44	478	377
PA PIKE													
1974	15	144	57	30	42	19	60	33	15	14	9	29	20
1985	15	237	85	51	62	28	90	50	23	20	12	49	37
1995	15	382	127	84	94	42	136	75	37	29	17	88	63
2005	15	536	167	121	127	57	183	100	53	38	23	113	95
2015	15	696	208	160	160	72	230	126	70	47	28	147	130
2025	15	857	248	200	193	86	277	152	87	56	33	182	166
PA SCHUYLKILL													
1974	105	513	135	158	111	37	148	167	17	29	42	30	19
1985	105	460	149	135	120	53	180	178	16	29	42	29	15
1995	105	516	157	153	128	56	192	190	17	30	45	33	17
2005	105	593	167	179	139	61	210	206	19	33	47	38	20
2015	105	692	181	214	153	67	231	226	21	35	50	45	26
2025	105	786	183	260	155	68	233	229	27	36	52	51	35

IDE ASSOCIATES, INC.

TABLE 4.A.10b —ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--HIGH POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
PA SNYDER													
1974	165	60	15	14	12	6	20	22	2	3	0	4	2
1985	165	85	19	21	15	7	25	28	2	4	1	5	3
1995	165	103	22	26	18	8	28	31	3	4	1	7	4
2005	165	122	24	32	20	9	31	35	3	5	1	8	5
2015	165	139	27	37	22	10	35	39	4	5	1	9	6
2025	165	155	29	42	24	11	38	43	4	6	1	10	7
PA SULLIVAN													
1974	140	12	3	3	3	1	4	5	0	1	0	1	0
1985	140	13	3	3	3	1	4	5	0	1	0	1	0
1995	140	17	4	4	3	2	5	6	0	1	0	1	1
2005	140	18	4	5	3	2	5	6	0	1	0	1	1
2015	140	21	4	6	4	2	6	7	1	1	0	1	1
2025	140	22	4	6	4	2	6	7	1	1	0	1	1
PA SUSQUEHANNA													
1974	95	110	39	33	31	13	44	45	5	9	1	7	3
1985	95	145	47	46	37	15	53	54	6	10	2	9	5
1995	95	191	56	62	46	19	65	66	7	11	2	12	7
2005	95	226	63	75	52	21	73	74	9	13	2	14	9
2015	95	264	70	89	58	24	82	83	11	15	2	17	11
2025	95	299	78	103	64	26	91	92	12	16	2	19	13
PA UNION													
1974	135	66	18	17	14	6	22	25	2	4	1	4	2
1985	135	84	21	22	17	8	26	29	2	4	1	5	3
1995	135	104	24	28	19	9	30	33	3	5	1	7	4
2005	135	122	26	34	22	10	33	38	3	5	1	8	5
2015	135	142	29	41	25	11	37	42	4	6	1	9	6
2025	135	160	32	46	27	12	41	47	4	7	1	10	7
PA WAYNE													
1974	40	166	86	55	61	24	82	66	13	16	5	16	7
1985	40	223	103	77	74	29	99	80	17	18	5	22	10
1995	40	306	130	108	93	36	125	100	23	22	7	31	15
2005	40	391	156	142	113	44	152	122	29	27	8	39	20
2015	40	478	182	177	133	51	179	143	36	32	9	48	26
2025	40	562	208	212	152	59	205	164	44	37	11	57	32
PA WYOMING													
1974	85	68	26	21	20	8	28	29	3	6	1	4	2
1985	85	85	29	28	23	9	32	33	4	6	1	5	3
1995	85	99	32	33	25	10	35	35	4	6	1	6	4
2005	85	118	35	41	28	11	39	40	5	7	1	7	5
2015	85	137	39	48	32	12	43	44	6	8	1	9	6
2025	85	150	41	54	34	13	46	47	7	9	1	10	7
PA YORK													
1974	195	518	111	113	85	39	142	159	12	18	3	32	17
1985	195	648	129	147	98	45	165	183	14	20	3	40	23
1995	195	776	145	182	112	51	188	209	17	22	3	49	30
2005	195	895	160	215	125	57	210	233	20	25	4	57	37
2015	195	1025	178	252	140	64	235	261	25	28	4	65	44
2025	195	1137	193	283	153	70	256	285	28	30	4	73	51
NJ TOTAL													
1974		27266	8983	8929	6766	2503	9236	9212	1327	1906	499	1842	1064
1985		34626	10780	11716	8069	3008	11024	10862	1758	2165	584	2499	1562
1995		40790	12197	14106	9216	3448	12587	12349	2147	2403	663	2983	1932
2005		47067	13464	16592	10328	3872	14102	13785	2592	2690	752	3558	2454
2015		52253	14647	18606	11319	4253	15456	15071	2959	2952	832	4004	2840
2025		56810	15712	20347	12212	4596	16676	16214	3258	3172	897	4405	3170
NJ BERGEN													
1974	70	4244	1358	1492	1072	392	1428	1451	200	289	47	264	160
1985	70	4943	1521	1808	1192	437	1589	1607	242	305	48	312	205
1995	70	5640	1672	2113	1322	484	1761	1779	289	329	51	357	246
2005	70	6278	1805	2387	1447	530	1928	1946	327	360	56	398	285
2015	70	6805	1926	2610	1555	569	2072	2091	360	388	60	432	315
2025	70	7329	2051	2827	1666	610	2219	2237	388	413	64	466	343
NJ ESSEX													
1974	75	3434	1179	1166	849	266	1131	1149	166	246	40	191	121
1985	75	4050	1308	1423	938	294	1249	1261	193	257	41	231	155
1995	75	4369	1335	1571	967	303	1288	1299	212	256	41	252	176
2005	75	4619	1352	1693	994	311	1323	1332	226	261	42	269	195
2015	75	4804	1367	1785	1015	317	1351	1358	238	265	42	281	210
2025	75	4972	1385	1865	1035	324	1378	1385	248	270	43	292	222
NJ HUDSON													
1974	85	2204	753	714	513	215	798	704	96	149	25	132	74
1985	85	2449	775	824	527	220	819	718	104	145	24	150	91
1995	85	2709	804	936	553	231	860	752	117	147	24	167	107
2005	85	2952	834	1047	580	243	902	789	131	154	25	184	125
2015	85	3186	871	1150	610	255	949	829	145	162	26	199	141
2025	85	3393	906	1241	639	267	993	867	157	168	27	212	155
NJ HUNTERDON													
1974	45	440	186	151	133	50	174	152	31	37	10	40	19
1985	45	657	261	237	186	69	243	211	47	48	13	60	32
1995	45	924	349	344	251	93	328	285	70	64	17	85	48
2005	45	1182	429	450	313	117	410	355	92	79	22	109	65
2015	45	1412	503	544	369	138	484	419	112	94	26	131	80
2025	45	1658	582	643	430	160	564	488	132	109	29	154	96

IDE ASSOCIATES, INC.

TABLE 4.A.10b —ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025—HIGH POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	BCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NJ MERCER													
1974	80	1274	420	425	323	110	426	448	58	91	14	75	45
1985	80	1632	505	570	386	131	508	532	75	103	16	98	66
1995	80	1948	583	714	451	153	593	620	95	116	18	120	83
2005	80	2386	670	876	527	179	693	724	116	135	21	145	105
2015	80	2705	742	1006	588	200	774	807	134	150	23	165	122
2025	80	3012	813	1129	648	220	853	894	150	165	25	186	139
NJ MIDDLESEX													
1974	80	2501	819	833	627	231	837	880	114	181	29	152	89
1985	80	3249	1008	1140	764	281	1020	1068	155	209	33	202	130
1995	80	3952	1172	1430	897	330	1198	1253	198	239	37	247	170
2005	80	4549	1299	1680	1013	373	1353	1411	233	268	42	285	205
2015	80	5077	1426	1895	1120	412	1496	1561	265	297	46	318	235
2025	80	5581	1550	2095	1224	450	1634	1704	292	323	50	350	261
NJ MONMOUTH													
1974	115	1349	345	387	284	117	406	461	43	78	141	83	52
1985	115	1783	430	533	352	145	504	568	58	91	161	112	76
1995	115	2194	503	673	416	171	596	671	73	105	184	139	99
2005	115	2556	563	800	472	195	677	762	87	119	209	162	122
2015	115	2883	621	913	525	216	753	847	99	132	230	183	141
2025	115	3158	670	1008	570	235	817	918	109	143	247	201	157
NJ MORRIS													
1974	60	1993	675	712	519	184	672	695	103	146	26	122	73
1985	60	2506	808	943	618	219	800	823	137	164	27	156	103
1995	60	3276	1020	1264	786	278	1018	1046	188	203	33	205	143
2005	60	3992	1209	1560	947	335	1228	1260	232	245	39	250	179
2015	60	4532	1354	1781	1070	379	1386	1422	264	276	44	284	206
2025	60	4965	1471	1959	1169	414	1514	1553	288	300	48	312	228
NJ OCEAN													
1974	125	605	153	162	133	60	200	223	16	33	4	38	21
1985	125	1068	246	298	214	96	322	358	28	50	7	68	41
1995	125	1381	296	397	261	117	392	435	37	59	8	89	57
2005	125	1635	331	483	297	133	446	493	45	67	9	106	72
2015	125	1825	358	548	323	144	485	536	51	73	9	119	84
2025	125	1957	375	595	341	152	512	566	56	77	10	128	93
NJ PASSAIC													
1974	50	2470	1011	851	710	255	949	837	158	196	50	194	98
1985	50	2905	1115	1040	782	281	1045	918	185	207	32	233	126
1995	50	3263	1190	1201	842	303	1125	986	214	214	53	264	151
2005	50	3679	1292	1381	922	331	1233	1080	246	236	58	299	180
2015	50	4040	1379	1543	993	357	1327	1162	279	253	62	329	206
2025	50	4308	1442	1663	1045	376	1397	1222	301	265	64	352	225
NJ PHILADELPHIA SMSA-NJ													
1974	125	2272	552	612	451	191	665	772	64	126	17	138	86
1985	125	3178	721	900	587	240	864	997	90	154	21	198	131
1995	125	3836	827	1119	678	286	998	1151	113	174	23	241	170
2005	125	4491	927	1341	774	327	1140	1312	135	197	26	283	210
2015	125	5099	1031	1540	867	367	1278	1471	156	222	30	322	245
2025	125	5640	1123	1717	951	402	1401	1611	174	242	32	357	276
NJ SALEM													
1974	165	133	30	32	25	10	37	44	3	6	1	8	5
1985	165	184	39	47	31	13	48	56	5	7	1	11	7
1995	165	229	46	60	37	15	56	66	6	9	1	14	10
2005	165	271	52	73	43	17	64	76	7	10	1	17	12
2015	165	302	56	82	47	19	70	83	8	11	1	19	14
2025	165	326	59	90	50	20	75	88	9	11	1	20	16
NJ SOMERSET													
1974	60	1032	349	368	269	94	348	361	53	75	12	63	37
1985	60	1324	426	496	328	115	424	437	71	87	14	82	54
1995	60	1564	488	601	376	132	487	501	89	97	16	97	67
2005	60	1762	532	687	418	147	541	556	101	107	17	110	78
2015	60	1981	591	778	468	164	605	622	114	120	19	124	90
2025	60	2105	630	822	501	176	649	666	119	128	20	131	94
NJ SUSSEX													
1974	20	413	175	107	118	50	162	106	48	40	22	76	40
1985	20	1383	546	377	366	155	504	326	158	118	62	259	150
1995	20	1666	731	428	494	210	681	440	188	154	81	305	152
2005	20	2424	869	700	597	254	823	531	298	186	98	460	301
2015	20	2830	992	830	687	292	947	611	358	215	112	537	364
2025	20	3167	1093	937	762	324	1050	677	403	236	122	602	416
NJ UNION													
1974	85	2178	667	729	530	189	706	742	93	142	23	132	81
1985	85	2339	681	816	538	192	717	750	103	137	21	144	96
1995	85	2504	698	896	557	199	742	775	115	137	21	156	109
2005	85	2629	707	958	574	205	765	797	122	140	21	164	119
2015	85	2717	719	1000	587	210	783	816	128	143	22	170	126
2025	85	2787	728	1032	590	213	797	830	132	145	22	174	131
NJ WARREN													
1974	20	725	311	187	210	91	296	187	80	71	38	133	67
1985	20	976	387	264	261	113	367	230	106	83	44	183	102
1995	20	1292	483	360	329	142	463	290	145	101	53	245	145
2005	20	1663	592	477	409	177	576	360	195	126	66	316	201
2015	20	2055	711	601	495	214	698	436	249	152	79	391	260
2025	20	2454	833	725	584	253	823	514	301	178	92	468	319

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TABLE 4.A.10b --ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--HIGH POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM -MING	PICNIC -KING	BOAT -ING	FISH -ING	HUNT -ING	HIKING	CAMP -ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT -ING	GOLF, MIN GOLF	TENNIS
NY TOTAL													
1974		40936	12215	12311	8732	3531	13243	12770	1645	2480	481	2604	1569
1985		46521	13070	14490	9316	3765	14075	13524	1880	2509	491	3053	1973
1995		52500	14005	16734	10096	4081	15205	14593	2196	2628	528	3522	2381
2005		57712	14736	18756	10833	4378	16264	15598	2470	2804	578	3936	2775
2015		62605	15576	20616	11575	4676	17325	16639	2743	2992	627	4318	3129
2025		67379	16457	22393	12336	4982	18416	17716	2992	3167	672	4680	3455
NY ALBANY SMSA													
1974	145	1718	401	442	319	150	514	551	45	84	12	107	61
1985	145	2025	442	544	351	163	561	602	52	87	13	128	80
1995	145	2293	474	633	379	178	610	651	61	92	13	147	97
2005	145	2576	508	729	413	194	664	707	71	99	14	166	116
2015	145	2793	535	804	439	206	706	751	79	106	15	180	131
2025	145	2977	559	866	462	217	743	789	85	110	16	192	143
NY BROOME & TIOGA													
1974	125	647	161	173	132	61	205	224	18	36	5	41	23
1985	125	743	172	208	140	65	217	236	20	36	5	48	29
1995	125	837	183	241	150	70	233	253	24	37	5	54	35
2005	125	922	192	272	161	75	249	270	27	40	5	60	42
2015	125	992	202	298	170	79	263	285	29	42	6	64	47
2025	125	1056	211	320	178	83	276	299	32	44	6	69	51
NY CHENANGO													
1974	175	90	21	21	18	8	28	32	2	4	1	6	3
1985	175	113	24	27	20	9	31	36	3	4	1	7	4
1995	175	132	27	33	22	10	35	40	3	5	1	9	5
2005	175	151	29	39	24	11	38	44	4	5	1	10	6
2015	175	168	31	44	27	12	41	48	4	6	1	11	8
2025	175	184	33	49	29	13	45	51	5	6	1	12	9
NY COLUMBIA													
1974	135	124	31	32	27	12	41	45	3	7	1	8	4
1985	135	156	36	42	31	14	47	52	4	7	1	10	6
1995	135	189	41	53	35	16	53	58	5	8	1	12	8
2005	135	221	45	64	39	18	60	65	6	9	1	14	10
2015	135	249	49	73	42	19	65	71	7	10	1	16	11
2025	135	275	52	82	46	21	71	77	8	11	1	18	13
NY DELAWARE													
1974	145	97	25	24	21	10	33	36	3	5	1	6	3
1985	145	123	29	32	24	11	38	42	3	6	1	8	4
1995	145	156	34	42	29	14	46	50	4	7	1	10	6
2005	145	202	42	55	36	17	57	62	5	8	1	13	8
2015	145	263	53	73	45	21	71	78	7	11	1	17	11
2025	145	325	63	92	55	25	86	94	9	13	2	21	14
NY DUTCHESS													
1974	95	784	248	243	195	74	268	285	32	54	9	48	27
1985	95	985	292	320	228	87	313	331	40	60	9	61	38
1995	95	1231	343	414	271	103	370	392	52	69	11	77	52
2005	95	1491	398	513	319	121	437	461	64	81	12	94	66
2015	95	1762	457	617	370	140	506	534	78	93	14	111	81
2025	95	2078	530	735	431	164	591	623	93	108	16	131	98
NY GREENE													
1974	105	103	32	31	27	11	39	40	4	7	10	6	3
1985	105	135	38	41	32	13	46	48	5	8	11	9	5
1995	105	169	44	53	37	15	53	56	6	9	13	11	7
2005	105	206	51	67	43	18	62	65	7	10	15	13	9
2015	105	242	57	80	50	20	71	74	9	12	17	16	11
2025	105	274	63	92	55	23	79	82	10	13	18	18	13
NY NASSAU & SUFFOLK													
1974	160	6222	1314	1599	1069	469	1641	1909	165	275	38	389	252
1985	160	7224	1462	1941	1182	519	1815	2099	200	286	39	458	324
1995	160	8312	1625	2287	1320	583	2028	2343	241	312	42	529	393
2005	160	9311	1764	2598	1458	640	2239	2585	272	345	47	594	455
2015	160	10325	1930	2902	1605	705	2466	2847	304	382	51	659	514
2025	160	11434	2116	3229	1770	777	2719	3136	337	418	56	732	575
NY NEW YORK CITY													
1974	100	23556	7354	7307	4988	1993	7821	7181	924	1452	238	1353	829
1985	100	25499	7443	8159	5016	2004	7865	7185	978	1393	224	1495	975
1995	100	27506	7544	8999	5137	2052	8055	7347	1061	1371	220	1630	1109
2005	100	28868	7518	9644	5204	2079	8161	7426	1124	1382	221	1725	1228
2015	100	29915	7527	10152	5255	2100	8240	7492	1180	1390	221	1798	1323
2025	100	30769	7558	10562	5309	2121	8325	7560	1229	1396	220	1856	1399
NY ORANGE													
1974	25	1852	853	537	561	225	770	532	193	179	85	279	140
1985	25	2439	1040	740	680	274	935	642	250	205	95	375	206
1995	25	3204	1288	1002	849	342	1167	800	339	249	115	497	291
2005	25	3873	1479	1243	993	399	1364	934	420	289	133	604	376
2015	25	4477	1661	1460	1125	452	1546	1058	496	328	150	701	451
2025	25	4953	1803	1632	1228	494	1687	1154	554	357	162	777	511
NY OTSEGO													
1974	180	107	25	25	20	9	33	36	3	5	1	7	4
1985	180	133	29	32	23	11	37	41	3	5	1	9	5
1995	180	161	32	40	26	12	42	46	4	6	1	10	7
2005	180	186	35	47	28	13	46	51	5	6	1	12	8
2015	180	210	38	54	31	15	51	56	5	7	1	14	10
2025	180	232	41	61	34	16	55	60	6	7	1	15	11

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TABLE 4.A.10b--ACTIVITY DAYS AT DISTANCES AS GREAT AS DISTANCE OF COUNTY GROUP FROM TOCKS ISLAND LAKE, 12 ACTIVITIES, 1,974 - 2,025--HIGH POPULATION GROWTH SERIES (ACTIVITY DAYS IN THOUSANDS)

STATE AND COUNTY GROUP YEAR	MINUTES TO TOCKS ISLAND LAKE	SWIM-MING	PICNIC-KING	BOAT-ING	FISH-ING	HUNT-ING	HIKING	CAMP-ING	HORSE RIDING	MCYCL SNOWM	ICE SKAT-ING	GOLF, MIN GOLF	TENNIS
NY PUTNAM													
1974	105	206	58	62	47	19	66	72	8	13	19	13	8
1985	105	316	84	101	68	28	95	103	12	17	26	20	13
1995	105	440	113	144	91	37	127	139	18	23	33	28	20
2005	105	580	143	194	117	48	164	179	24	29	43	37	27
2015	105	736	178	248	147	60	206	224	31	37	54	47	35
2025	105	933	223	317	185	76	260	282	39	47	67	60	46
NY ROCKLAND & WESTCHESTER													
1974	90	4446	1307	1489	1020	380	1393	1452	192	279	45	275	178
1985	90	5273	1485	1838	1151	429	1572	1631	237	298	47	330	231
1995	90	6159	1672	2192	1307	488	1785	1849	286	327	51	387	282
2005	90	7007	1843	2528	1467	547	2004	2073	327	365	57	441	331
2015	90	7918	2052	2875	1644	613	2246	2323	372	411	64	500	381
2025	90	8885	2284	3240	1836	685	2508	2593	417	457	71	561	431
NY SCHOHARIE													
1974	155	59	15	15	13	6	20	22	2	3	0	4	2
1985	155	80	18	20	15	7	24	27	2	4	1	5	3
1995	155	100	21	26	18	8	29	32	3	4	1	6	4
2005	155	121	24	33	21	10	33	36	3	5	1	8	5
2015	155	131	27	34	24	11	37	41	3	6	1	8	5
2025	155	158	30	44	26	12	41	45	4	6	1	10	7
NY SULLIVAN													
1974	45	294	139	99	99	37	132	112	21	27	8	26	11
1985	45	402	178	139	126	47	168	141	28	32	9	36	17
1995	45	517	213	184	153	57	204	171	36	38	10	47	23
2005	45	661	258	239	188	70	251	210	45	46	13	60	32
2015	45	812	306	299	225	83	300	251	56	55	15	74	41
2025	45	965	352	361	261	97	348	291	68	64	17	89	50
NY ULSTER													
1974	70	630	231	212	178	66	240	241	31	50	8	38	21
1985	70	875	298	306	229	85	309	308	42	61	10	54	32
1995	70	1094	350	392	272	100	366	366	54	70	11	68	43
2005	70	1339	407	493	321	119	433	431	67	83	13	84	56
2015	70	1612	473	603	377	139	508	506	83	97	15	102	70
2025	70	1880	539	712	433	159	583	579	97	110	17	119	85
CT TOTAL													
1974		4535	1082	1265	892	384	1325	1486	130	238	240	283	179
1985		5473	1235	1592	1013	436	1505	1679	160	256	246	348	234
1995		6374	1373	1902	1138	490	1691	1863	194	278	264	408	289
2005		7255	1504	2206	1267	546	1884	2095	224	308	290	466	344
2015		8088	1644	2485	1396	602	2076	2306	254	340	317	520	394
2025		8895	1781	2752	1523	657	2265	2515	280	368	341	573	440
CT FAIRFIELD													
1974	115	2300	560	672	464	194	670	752	72	125	224	144	93
1985	115	2679	622	816	512	214	739	826	86	130	229	170	120
1995	115	3077	686	960	570	238	823	918	103	141	245	196	145
2005	115	3457	745	1096	629	263	909	1012	117	155	269	221	169
2015	115	3825	811	1222	690	288	997	1110	131	170	294	245	191
2025	115	4190	877	1346	752	314	1086	1208	143	184	317	269	211
CT LITCHFIELD													
1974	135	365	84	97	72	33	109	123	9	18	3	23	13
1985	135	461	100	128	84	38	128	143	12	20	3	30	19
1995	135	568	117	163	100	45	152	169	16	23	3	37	25
2005	135	689	136	203	118	54	179	200	20	27	4	45	32
2015	135	793	153	236	134	61	204	227	23	31	4	52	38
2025	135	886	169	266	148	68	226	252	26	34	5	58	43
CT NEW HAVEN													
1974	135	1870	437	496	357	158	546	611	49	95	13	116	69
1985	135	2333	514	647	417	184	638	710	62	105	15	148	95
1995	135	2729	571	779	469	207	717	796	75	114	16	174	119
2005	135	3109	623	907	520	230	796	883	87	126	17	200	143
2015	135	3471	680	1026	572	253	875	971	100	139	19	223	165
2025	135	3819	735	1140	623	275	953	1055	111	150	20	246	185
DE TOTAL													
1974		931	217	237	172	72	260	304	26	46	7	55	33
1985		1166	256	310	202	84	305	354	32	51	7	71	46
1995		1399	292	383	232	97	351	407	39	57	8	86	59
2005		1630	326	457	263	110	398	460	47	65	9	100	73
2015		1838	358	523	292	122	442	511	54	72	10	113	85
2025		2012	386	579	316	132	479	552	60	77	11	125	99
DE NEW CASTLE													
1974	150	931	217	237	172	72	260	304	26	46	7	55	33
1985	150	1166	256	310	202	84	305	354	32	51	7	71	46
1995	150	1399	292	383	232	97	351	407	39	57	8	86	59
2005	150	1630	326	457	263	110	398	460	47	65	9	100	73
2015	150	1838	358	523	292	122	442	511	54	72	10	113	85
2025	150	2012	386	579	316	132	479	552	60	77	11	125	99

V.A. OVERVIEW AND INTRODUCTION

The essential purpose of Chapter V is to provide a review of the present electric power situation in the previously defined electric power service area, which includes the Delaware River Basin, and to evaluate future electric power development in the electric service area. One of the primary outputs of this chapter will be to determine the consumptive water uses by power plants which are located in the Delaware River Basin.

Beginning in mid-1973 and continuing to the present day, a number of developments are having significant effects on the energy sector as a whole and on the electric power industry in particular. Some of the developments affecting the electric power situation are:

- Natural gas and oil prices have increased two-to-four fold and often these fuels are not available for power plant boilers.

- Increasing pressures by nuclear power plant intervenors, plus serious questioning of the nuclear option by public and political leaders, mean that the future of nuclear power is uncertain.

- Increasingly stringent environmental regulations and land use controls are severely limiting the locations where new generating facilities of all types can be placed.

- Nuclear plant licensing problems and the financial problems of the electric utilities in general have combined to significantly delay the construction of many nuclear plants originally scheduled for operation during the next 10 years.

- Potentially significant changes in the factors which influence electricity demand are making it extremely difficult to forecast the future need.

The above factors are causing both short and long term dislocations in the attempts to plan for the orderly development of electric power. If anything, the pressures are becoming more intense, and the future is becoming more uncertain. The electric service area (ESA), defined in Chapter I and shown in Figure 1, is not immune from any of these pressures.

Wide ranges of uncertainty exist in the variables which effect the future power situation in the electric service area; therefore, the approach taken in the analyses which follow is to evaluate potential options for the future development of electric power. For example, to determine power plant water consumption at a future time, it is first necessary to know what the power demand will be at that time, what types of power generating facilities and cooling methods will be used to satisfy the demand, and where these plants are located.

Because of the dynamically changing situation occurring in the United States and the service area, it is not possible to predict exact relationships among the demand, supply, and siting variables. Therefore, it is necessary to investigate how each <u>could</u> vary as a consequence of governmental and public pressures. An important objective of this chapter, then, is to characterize the options which are available for future power development in the service area.

To achieve this objective, it is necessary to define and evaluate the different strategies which support the options. The basic options, or scenarios, have been defined which reflect the range of uncertainty relating to the variables of power demand, power supply, and plant siting. The future policies, decisions and institutional constraints which are implemented by federal and state regulators will determine which option, or close alternative, is carried out.

The intent is to define and conceptually evaluate what are considered to be the potentially viable "electric future" options (scenarios) for the electric service area.

The basic ones which have been identified are:

Scenario A-1: This scenario is characterized by a probable high power demand forecast in the electric service area (ESA), an emphasis on using nuclear power plants as the main source of supply, and probable high siting (30 percent of year 2000 capacity) of the supply in the Delaware River Basin (DRB) with the remaining supply being assigned to the other ESA sub-regions.

Scenario A-2: Same as A-1, except that it is based on probable low siting (15 percent of year 2000 capacity) of the supply in the DRB.

Scenario B-1: This scenario is characterized by a probable low power demand forecast, an emphasis on using nuclear power plants as the main source of supply, and probable high siting (30%) of the supply in the DRB with the remaining supply being assigned to the other ESA sub-regions.

Scenario B-2: Same as B-1, except that it is based on probable low siting (15%) of the supply in the DRB.

Scenario C-1: This scenario is characterized by a probable high power demand forecast, a primary reliance on non-nuclear power generation as the main source of supply, and probable high siting (30%) of the supply in the DRB with the remaining supply being assigned to the other ESA sub-regions.

Scenario C-2: Same as C-1, except that it is based on probable low siting (15%) of the supply in the DRB.

Scenario D-1: This scenario is characterized by a probable low power demand forecast, a primary reliance on non-nuclear power generation as the main source of supply, and probable high siting (30%) of the supply in the DRB with the remaining supply being assigned to other ESA sub-regions.

Scenario D-2: Same as D-1, except that it is based on probable low siting (15%) of the supply in the DRB.

In addition to evaluating the eight scenarios described above, a "probable" (subjective) scenario has been developed. This is not intended as a prediction of future power development in the ESA. It serves mainly as a basis for making the probable power plant water consumption estimates needed in Chapter III. This "subjective" scenario is based on the selection of intermediate values between the extremes of the power demand, power supply, and plant siting variables. It is viable only if the ESA planners and decision-makers, acting on behalf of public interests, decide

that it is the one which represents desired objectives. The same consideration holds for each of the other scenarios listed above, or other "probable" scenarios which could be developed.

For each scenario, future power plant water demand calculations can be made with a relatively high degree of accuracy because the variables affecting water demand have been fixed in each case. Variations within the scenarios briefly described above will be considered; for example, the effects on water consumption based on different assumptions as to the future once-through/cooling tower mix will be evaluated.

In defining the scenarios, every care has been taken to assure their realism. The political and technical assumptions which are the basis for each one can be implemented provided the necessary actions are taken. By analyzing future electric power development as outlined above, the different results of following different strategies are clearly illustrated. In this report, the following outputs are derived for each scenario:

- The types and quantities of electric energy conversion facilities which satisfy a given power demand level.
- The locational distribution of such facilities within the ESA on a sub-regional basis.
- The quantities of water consumed as related to the types of cooling systems used.

The approach described in the preceding discussion and the analyses in the following sections answer to the electric power Scope of Work

(Section 3.a.6) for the comprehensive review. Portions of Section 3.a.6 are repeated below for convenience:

> "The Tocks Island Lake Project is related to electric power needs of the Pennsylvania, New Jersey and Maryland interconnection market area to an extent greater than would be indicated by the relatively minor conventional, at site generating capacity involved. Data will be prepared on present supply and estimated future electric power requirements for the period of analysis, including the effects of existing and planned capacity additions with consideration of the federal, EPA, state electric guidelines and the FWPCA PL92-500 in evaluating power plant location and water consumption. Probable high, probable low and most probable series will be developed reflecting the contractor's judgement of practical policies which could achieve reduced levels of demand, including the effect of price on elasticity of demand for electric power. From estimates of the most probable future levels of power requirements and probable or known thermal plant locations, both fossil fueled and nuclear, estimates of potential cooling water needs will be developed. Consideration will be given to the effect on needs of high and low rates of water use for energy production and to possible restrictions on once-through cooling and the consequent use of alternative processes, including analysis of availability of out-of-basin sites for generation..."

Time period being addressed in evaluating future electric power needs.

Future power demand options, the expected results of research and development on new generation technology, and the approach for siting the new generation can be reasonably defined during the period 1975 - 2000; thus, objective evaluations of alternative power development strategies can be made. There is speculation involved to some degree, but the range of uncertainty can be dealt with in a quantitative manner.

However, during the period 2001 to 2025, the demand, supply and siting variables are unknown quantities. For example, _if_ commercial development of fusion occurs around 2000 and _if_ large scale solar thermal plants become a reality, these two successes in themselves would significantly change the demand-supply-siting relationships presently being contemplated during the 1975-2000 frame. In other words, a more abundant supply could allow the demand growth rate to increase above previous levels, while the siting methods for these advanced technologies could be very different than those being used now. Thus, quantitative evaluations of future power development in the electric service area during 2001 to 2025 would be extremely speculative, and it is concluded that for the purposes of this study; i.e., investigating the existence of one or more viable alternatives to the Tocks Island Lake Project, that 25 year quantitative evaluations are appropriate.

V.B. SUMMARY OF CHAPTER

The existing power situation in the electric service area (ESA), Figure 1, has been examined. Present and past power demand trends have been analyzed, and inventories of existing power projects have been prepared using maps and tables.

The present power demand (1974 summer peak) was about 31,900 MWe for the electric service area (see Table 5-1) representing an approximate 6.0% decrease from the 1973 summer peak. This sudden decrease followed a nine year period during which the average annual growth rate was about 8.0%, and can be attributed to a combination of milder weather, electricity price increases, conservation measures taken in response to the energy crisis, and possibly the general economic slowdown.

The existing power supply in the ESA, as of December 1974, consists of about 44,000 MWe, with about 23% of this being in the Delaware River Basin (DRB). Of the total capacity within the ESA, the breakdown by plant type is nuclear (10%), fossil-steam (65%), gas turbines and diesels (20%), conventional hydro (3%) and pumped storage (2%). A large proportion of the capacity in the ESA (and DRB) is presently supplied by gas turbines, which require natural gas or fuel oil. Approximately 70% of the fossil plant capacity in the DRB is oil-fired, whereas greater than 70% of the fossil plant capacity in the Susquehanna River Basin (SRB) is coal-fired.

Figures 2 and 3 show plant characteristics and locations for existing nuclear, fossil, hydroelectric and pumped storage in the DRB and SRB.

Load forecasts made in 1971 and early 1974 by the Delaware River Basin Electric Utilities Group (DRBEUG) indicated that the expected future growth rate is lower than previous projections, (see Figure 5). DRBEUG represents the major portion of the plant resource mix in the electric service area. Figures 6 and 7 show plant characteristics and locations for planned installation by 1988 of nuclear, fossil, hydroelectric, and pumped storage units in the DRB and SRB.

Potential scenarios for future power development in the electric service area have been defined and conceptually evaluated. These scenarios are intended to bridge the range of uncertainty which apply to future power demand, power supply, plant siting, and the consumption of water due to power generation. Each is based on an explicit set of assumptions and considerations.

Future "probable high" and "probable low" power demand options have been estimated independently of past demand, and have taken into account the potential effects of future population growth, economic growth, personal income growth, peak demand price increases, constraints relating to future power supply, potential electrification of end uses presently depending on fossil fuels, and conservation measures. As shown on Figure 4, the probable high and probable low peak demands in 2000 are estimated to be about 138,500 MWe and 65,600 MWe, respectively.

Two different future power plant resource mix options have been conceptually evaluated for each of the demand options. One resource mix option basically assumes that most of the new generation added between 1975-2000 is nuclear, while the other assumes that a nuclear slowdown occurs and much of the new generation is non-nuclear. Both options take account of advanced energy conversion alternatives, with each showing a different emphasis on how the future resource mix could utilize the emerging alternatives. The R & D status of the advanced technologies have been evaluated so that projections as to their expected commercial availability could be made.

Four scenarios are created in combining the two demand options and the two supply options. Two basic siting options have been used with each, creating a series of eight scenarios. One siting option is based on a "probable high siting" (30% of ESA capacity in 2000 is in DRB) of future power plants in the DRB, and the other is based on a "probable low siting" (15% of ESA capacity in 2000 is in DRB) of future plants in the DRB. These siting options enclose the present siting trend in the DRB (23% of present ESA capacity is in DRB). The effects of EPA's new power plant effluent limitations on water consumption have also been examined within each of the eight scenarios. The eight scenarios are depicted by Tables 5-10 to 5-17, and the explicit assumptions and considerations upon which each is based are in the text. Each table provides the following summary information:

- The power demand option being used.

- How the resource mix option is structured to meet the demand.
- The portions of the resource mix in the DRB and other regions of the ESA.
- The projected water evaporation resulting from thermal power plant operation in the DRB.
- The approximate number of thermal power plant sites needed in the DRB.

The scenarios range from "no electrical growth" in the DRB to "high electrical growth". The "no-growth cases" are illustrated by B-2 and D-2 (low power demand growth, essentially no additional siting in the DRB), and the "high growth" cases are illustrated by A-1 and C-1 (high power demand growth, increased siting in the DRB compared to present trend). The other four scenarios (A-2, B-1, C-2, and D-1) represent intermediate pictures of potential power development within the ESA.

In addition to the above, a "probable" (subjective) scenario has been developed by integrating various features of the basic eight. This is only one of many which could be called "probable" scenarios, and it is merely one estimate of electric power development in the electric service area. Again, the future constraints imposed by regulators and legislators, acting on behalf of the public, will establish which scenario is to be followed.

Each scenario represents a strategy for future power development, and each is based primarily on proven technology and technologies expected to be available during 1975-2000. New energy conversion technologies are included only when they are reasonably far enough along in research

and development that near future availabilities are highly likely. Thus, the choice of one scenario over another will not be based on technical constraints; rather, it will be based on a variety of essentially non-technological inputs to the decision making process (such as, socio-economic, environmental, and political factors).

Based on the evaluations of this chapter, a number of observations and conclusions can be made as to the electric service areas resource needs in the future:

- Future power demand will be influenced by causal factors which probably will not be representative of the past demand. Therefore, future demand needs to be analyzed essentially independent of past demand trends. There is reason to believe that 1974 represented a significant turning point in the growth of power demand as a result of emerging conservation policies, increasing costs of electricity and competing fossil fuels, and other factors.

- It is generally within the power of federal and state legislators and regulators to set constraints and standards which will have the effect of producing the results shown in any of the scenarios. Methods for controlling future power demand are available. Concerted action to adopt the philosophy of one resource mix option or the other would provide a plant mix that could be expected to meet the chosen power demand. A siting program in the ESA for the future plant mix could be developed in an optimum manner to balance utilization of the region's natural resources.

- The future electric energy health of the electric service area (as defined), or a similarly sized area which is not based on artificial or political boundaries, will be better assured if electric development is planned for the area as a whole, rather than for arbitrary sub-areas on a piecemeal basis.

- Future power plant water consumption in the DRB is obviously highly sensitive to the demand, supply, siting, and cooling variables. For example, Scenario A-1 (high power demand, a nuclear dominant resource mix, a relatively large portion of the mix located in the DRB) and stringent implementation of EPA's power plant effluent limitations lead to a projected high water consumption of about 540 cfs in the DRB by 2000.

Liberal implementation of these limitations (or change in the law) could lead to a projected high water consumption under Scenario A-1 of about 400 cfs. On the other hand, Scenario A-2 (high demand, nuclear dominant resource mix, and a relatively low portion of the mix located in the DRB) and stringent implementation of EPA's power plant effluent limitations lead to a lower projected water consumption of about 260 cfs in the DRB by 2000.

- In addition to providing the potential for further pumped storage development in the DRB, constructing the Tocks Island reservoir would provide the potential for locating more thermal power plants in the DRB than might be the case. This result is obtained because the reservoir would provide flow augmentation to make up for evaporative water losses from the additional once-through and cooling power systems in the basin.

  The "1-series" scenarios show the case of an increased rate of siting in the DRB in comparison to the present trend, and the "2-series" scenarios show the case of a decreased rate of siting. The "1-series" could illustrate the power plant siting situation with the reservoir, and the "2-series" could illustrate the situation without it. However, it should be pointed out that in the event Tocks Island reservoir is not constructed, utilities can still site additional facilities in the DRB by building storage reservoirs at individual plant sites to provide flow augmentation for the Delaware River and tributaries. The cost of such reservoirs would be high and could potentially cause significant overall environmental effects.

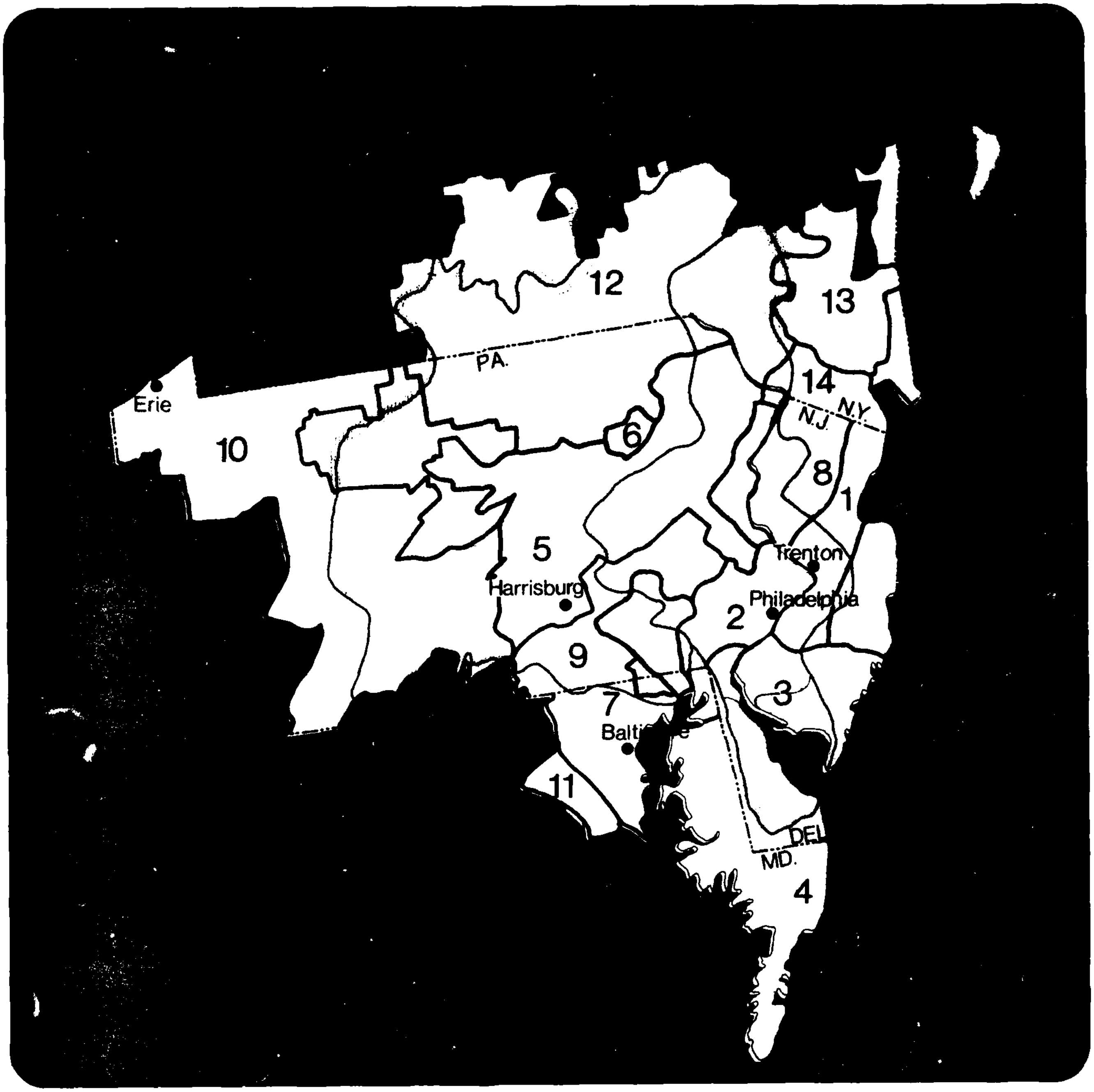
- New peak power facilities are needed in all the scenarios. As of 1975, nearly all of the peak power needs are supplied by gas turbines. There are great uncertainties as to whether or not fuel oil will be available in the future for operating these existing facilities, much less new ones. In general, there appears to be no valid basis for expanding the already over-developed gas turbine capacity. Specifically, the peak power alternatives, including gas turbines, to the proposed 1300 MWe Kittatinny Pumped Storage project are evaluated in Chapter XIV.

V.C. PRESENT POWER SITUATION IN THE ELECTRIC SERVICE AREA

V.C.1 PRESENT POWER DEMAND

The electric service area (ESA) has been defined in Chapter I, and consists of the Pennsylvania - New Jersey - Maryland Interconnection (PJM) plus three New York utilities. Figure 1 shows the ESA and subregions which are used in subsequent analyses. Utilities must add new capacity to cover increases in the peak demand; consequently, one emphasis in Chapter V is to examine the present and future peak demand situation. One can examine peaks using energy demand (kilowatt hours) or capacity demand (kilowatts), or both. Capacity demand has been chosen as the vehicle in these analyses because utilities must install new capacity to meet future peak demand. For example, if the power demand in an area is 15,000,000 kw (or 15,000 MW), one can think of this demand as being supplied by 15 plants, each of which has a capacity of 1000 MW and is operating at full load. The energy produced by these 15 plants, if operated for one hour at full load would be 15,000,000 kwh.

Table 5-1 shows the growth in summer peak demand for the electric service area from 1964 through 1974. The peak demand increased from about 16,630 MW in 1964 to about 33,850 MW in 1973, and then decreased to about 31,940 in 1974. The nearly 6% decrease in demand experienced from summer of 1973 to summer of 1974 is at least in part due to conservation techniques initiated in late 1973. The average annual growth rate during



LOCATIONS OF ELECTRIC SERVICE AREAS

V 1

0 12 24 36 48 60
SCALE IN MILES

N

LEGEND

1 Public Service Electric and Gas Company
2 Philadelphia Electric Company
3 Atlantic City Electric Company
4 Delmarvn Power & Light Company
5 Pennsylvania Power & Light Company
6 UGI Corporation, Luzerne Electric Division
7 Baltimore Gas and Electric Company
General Public Utilities Corporation
8 Jersey Central Power & Light Company
9 Metropolitan Edison Company
10 Pennsylvania Electric Company
11 Potomac Electric Power Company
12 New York State Electric & Gas Corporation
13 Central Hudson Gas & Electric Corporation
14 Orange and Rockland Utilities, Inc.

COASTAL REGION
DELAWARE RIVER BASIN
SUSQUEHANNA RIVER BASIN
'OTHER' REGION
Boundary of Delaware and Susquehanna River Basins

A COMPREHENSIVE STUDY OF THE
TOCKS ISLAND LAKE PROJECT & ALTERNATIVES
URS / MADIGAN-PRAEGER, INC. & CONKLIN AND ROSSANT

the nine year period 1964 to 1973 was 8.2%, but during the nine year period 1965 to 1974 it was 6.7%. Thus, 1974 was indeed an important juncture point for power demand. The question now is whether future power demand will again soon resume the historic high growth rate, or whether the decrease in 1974 truly marks the beginning of a future period of much lower growth rates. One important purpose of this chapter will be to investigate future power demands in the ESA as a consequence of many forces acting to decrease the rate and some acting to increase it.

The latest complete data obtainable from the Federal Power Commission (FPC, 1974) show that the PJM system (95% of the ESA) was a net importer of electric energy in 1973. A net of about 3 billion kwh of the 152 billion kwh consumed within PJM were imported, primarily from New York and Maryland utilities. In terms of total amounts, about 12 billion kwh were imported, 9 billion kwh were exported, and 149 billion kwh were generated by PJM plants.

Although an estimated 80 to 85 percent of the New York State Electric & Gas Corporation service area is within the ESA, as defined for the purposes of this study, it was assumed that this utility's entire peak demand is part of the ESA demand since information is not readily available to make an accurate breakdown.

As a basis for evaluating the existing power demand in the ESA, the end of 1974 was arbitrarily defined as "the present"

point in time. Detailed information regarding both peak load demand, as well as generating capacity within the ESA are being updated by the various utilities to include the December 31 date. Since the following evaluations are based on estimates of the present power demand and capacity, they will be reviewed to incorporate any further information which may affect conclusions of this study.

V.C.2 PRESENT POWER SUPPLY

The existing power supply in the electric service area consists of nuclear, fossil, gas turbine, hydroelectric, and pumped storage plants. The breakdown of plant types by sub-region of the electric service area is shown in Tables 5-2, 5-3, and 5-4. Table 5-2 shows the plant distribution for the total electric service area (ESA), Table 5-3 shows the distribution for the Pennsylvania - New Jersey - Maryland (PJM) Interconnection portion of ESA, and Table 5-4 shows it for the three New York utilities portion of ESA. Thus, Table 5-2 is the sum of Tables 5-3 and 5-4.

The tables reflect the power generating resources as of December 31, 1974. It can be seen that nearly all of the existing ESA capacity is located in the PJM service area. Several references which were prepared during 1974 and 1975 were used to prepare these tables. The references used are:

Master Siting Study, DRB, May 1974

Master Siting Study, SRB, March 1974

Table 5-1

Summary of Peak Summer Demand in Electric Service Area (MWe)

Segment of Service Area / Year	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
PJM[1] (Actual)	15,285	16,346	17,852	18,355	21,206	22,862	23,838	25,529	27,852	30,993	29,065[3]
New York Companies[2] (Estimated)	1,344	1,485	1,633	1,695	1,929	2,095	2,264	2,407	2,591	2,856	2,873(Est.)
Total Electric Service Area Demand	16,629	17,831	19,485	20,050	23,135	24,957	26,102	27,936	30,443	33,849	31,938

(1) Source: *PJM Power System Statement to the Federal Power Commission for year ending December 31, 1973*

(2) Source: *New York Power Pool Report, Volume 1, 1974.* Demand figures are estimates based on data in this report.

(3) Source: PJM

Table 5-2

Estimate of Generating Capacity in the Electric Service Area

as of January 1, 1975

Resource Category	Capacity in MWe						
	DRB	SRB	Coastal Region	Other (1)	Unassigned (2)	Total	% of Total
Nuclear	—	2962	620	895	—	4477	10
Fossil-Steam	6168	4655	7152	9216	1286	28777	65
Gas Turbine & Diesel	2972	62	3335	1678	535	8582	20
Hydroelectric	88	864	46	95	—	1093	3
Pumped Storage	330	880	—	76	—	1286	2
Total (MWe)	9558	9423	11453	11960	1821	44215	100
Percent of Total	22	21	26	27	4		

(1) Explained in text.

(2) But located within DRB or SRB.

Table 5-3

Estimate of Generating Capacity in the PJM Portion of the Electric Service Area as of January 1, 1975

Resource Category	Capacity in MWe						
	DRB	SRB	Coastal Region	Other[1]	Unassigned[2]	Total	% of Total
Nuclear	—	2962	620	895	—	4477	11
Fossil - Steam	6168	4370	5644	8729	1286	26217	63
Combustion Turbine & Diesel	2972	62	3196	1665	535	8430	21
Conventional Hydro	44	864	—	55	—	963	2
Pumped Storage	330	880	—	76	—	1286	3
Total (MWe)	9514	9138	9480	11420	1821	41373	100
Percent of Total	23	22	23	28	4	100	

(1) Explained in text.

(2) But located within DRB or SRB.

Table 5-4

Estimate of Generating Capacity for the 3 New York Utilities Within the Electric Service Area as of January 1, 1975

Resource Category	Capacity in MWe						
	DRB	SRB	Coastal Region	Other (1)	Unassigned (2)	Total	% of Total
Nuclear	—	—	—	—		—	—
Fossil - Steam	--	285	1788	487		2560	90
Combustion Turbine & Diesel	—	—	139	13		1520	5
Conventional Hydro	14	—	46	40		130	5
Pumped Storage	—	—	—	—		—	—
Total (MWe)	44	285	1973	540		2842	100
Percent of Total	1	10	70	19		100	

Power System Statement, Federal Power Commission, Dec 1973

New Jersey Master Siting Plan, Jan 1975

Federal Power Commission News, Nov 1974

Member Electric Corporations of the New York Power Pool and the Empire State Electric Energy Research Corp., April 1974

Due to the uncertainty in predicting when new plants go on-line commercially, and older equipment would be retired or derated, the tabulated capacities are approximate. Hence, when the utility companies finalize and make available their own detailed inventories, it is likely that the resource mixture and total capacities would be modified slightly from those indicated in the tables.

Figure 1 shows the approximate boundaries of the ESA together with geographic subregions used in the tables. The boundaries of the first two subregions, the Delaware River Basin (DRB) and the Susquehanna River Basin (SRB), are essentially the same as those presented in the Master Siting studies for these Basins. The third subregion, the Coast, is noted on the scenario location maps and is defined as the portions of the ESA located east of the Delaware Basin plus the Delmarva Peninsula. The coastal subregion also includes offshore areas suitable for proposed floating nuclear installations, and much of the brackish water portion of the Delaware Bay estuary.

The fourth subregion used in the tables is defined as "other" and

simply consists of generating capacity within the ESA not assigned to the preceding three subregions. This subregion accounts for roughly 27 percent of the total estimated capacity in the ESA. Nearly three fourths of this 27 percent is provided by the Baltimore Gas and Electric and Potomac Electric Power Companies in Maryland, both of which are in PJM. It should be noted that since roughly 90 percent or more of the Baltimore Gas and Electric Company service area is in the "other" subregion, its entire generating capacity has been assigned to this subregion.

The fifth subregion is referred to as "unassigned" and consists of generating capacity within both the Delaware and Susquehanna River Basins for which there was not enough information available to accurately locate the plants. This subregion includes roughly 4 percent of the estimated total ESA generating capacity and approximately 30 percent of this consists of the various utility company allotments from the Conemaugh and Keystone plants.

V.C.3 PRESENT POWER PLANT LOCATIONS

The tables and maps on Figures 2 and 3 summarize the existing power plants as of early 1975 reported by the utilities operating in the Delaware and Susquehanna River Basins. Existing plants are listed with an index to the map indicated in "lower case" letter and appropriate numbers, with fossil (f), nuclear (n), hydro (h) and pumped storage (ps) identified.

0 8 16 24 32
SCALE IN MILES

N

LEGEND

f1 FOSSIL (F) SERIES 1 THRU 21

h1 HYDRO (H) SERIES 1 THRU 5

ps PUMPED STORAGE

EXISTING POWER PLANTS IN THE DELAWARE RIVER BASIN (AS OF EARLY 1974)

V 2

A COMPREHENSIVE STUDY OF THE
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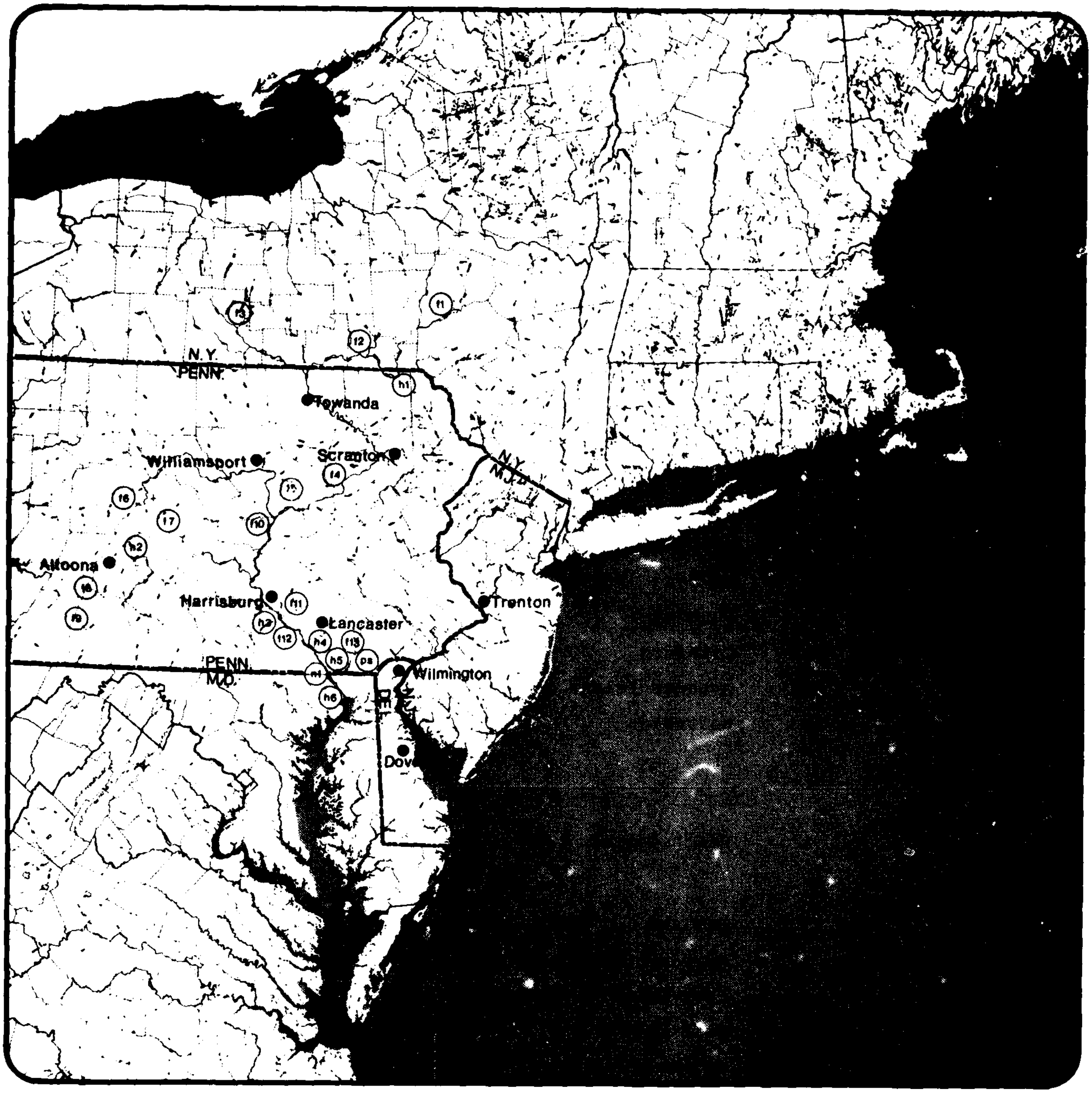
Figure V-2 (cont'd.)

EXISTING POWER PLANTS IN THE DELAWARE RIVER BASIN[1/] (AS OF EARLY 1974)

Type	Number	Name	(owner)	Electrical Capacity MW_e	Max. Heat Prod. MW_t
Fossil Steam (f) Series					
	1	Portland	GPU	404	511
	2	Martins Creek	PPL	300	473
	3	Gilbert	GPU	113	249
	4	Mercer	PSEG	600	751
	5	Burlington	PSEG	418	468
	6	Richmond	PhE	409	706
	7	Delaware	PhE	330	427
	8	Southwark	PhE	369	527
	9	Eyler	GPU	51	142
	10	Titus	GPU	234	323
	11	Cromby	PhE	357	504
	12	Barbadoes	PhE	134	296 avg
	13	Schuylkill	PhE	299	423
	14	Eddystone	PhE	662	761
	15	Greenwich	ACE		
	16	Chester	PhE	202	576
	17	Edge Moor	DMV	791	1074
	18	Deepwater	ACE	274	468
	19	Delaware City	DMV	120	168
	20	Vineland	CVNJ	67	101
	21	McKee Run	CDD	34	51
			Sub-total	6168	8999
Hydro (h) Series					
	1	Swinging Bridge	ORU	12	---
	2	Mongaup	ORU	4.	---
	3	Rio	ORU	10.	---
	4	Wallenpaupack	PPL	44.	---
	5	Grahamsville	ORU	18.	---
			Sub-total	88	
Pumped Storage					
	ps	Yards Creek	PSEG GPU	330	---
			Total	6586	8999

1/ Identified by utilities operating in the basin 1974



EXISTING POWER PLANTS IN THE SUSQUEHANNA RIVER BASIN (AS OF EARLY 1974)

V
3

LEGEND

- (f1) FOSSIL (F) SERIES 1 THRU 13
- (n1) NUCLEAR (N) SERIES
- (h1) HYDRO (H) SERIES 1 THRU 6
- (ps) PUMPED STORAGE

Figure V-3 (cont'd.)

EXISTING POWER PLANTS IN THE SUSQUEHANNA RIVER BASIN[1/] (AS OF EARLY 1974)

Type	Number	Name	(Owner)	Electrical Capacity MW_e	Max. Heat Prod. MW_t
Fossil Steam (f) Series					
	1	Jennison	NYSEG	76	176
	2	Goudley	NYSEG	132	313
	3	Hickling	NYSEG	90	158
	4	Hunlock	LED-UGI	93	158
	5	Montour	PPL	1515	2554
	6	Shawville	GPU	585	817
	7	Milesburg	WPP	44	74.9
	8	Williamsburg	GPU	30	79
	9	Saxton	GPU	35	124
	10	Sunbury	PPL	390	593
	11	Crawford	GPU	111	243
	12	Brunner Island	PPL	1454	2005.6
	13	Holtwood	PPL	73	197.7
			Sub-total	4628	7493.2
Nuclear (n) Series					
	1	Peach Bottom	PhE	40	70.3
Hydro (h) Series					
	1	Oakland	GPU	1	------
	2	Warrior Ridge	GPU	2	------
	3	York Haven	GPU	10	------
	4	Safe Harbor	SHWPC	230	------
	5	Holtwood	PPL	102	------
	6	Conowingo	PhE	512	------
			Sub-total	857	
Pumped Storage (ps) Series					
	ps	Muddy Run	PhE	880	------
			Total	6405	7563.5

1/ Identified by utilities operating in the basin 1974

About 97% of the electrical generating capacity in the Delaware River Basin is fossil-fueled, with total hydroelectric and available pumped storage-hydro roughly splitting the remainder. Of the fossil-fueled power plants, about 20 percent of this capacity consists of gas turbines and diesels.

In the Susquehanna River Basin, the overall total capacity is about equal to that in the DRB, but the resource mix is markedly different, with 72% fossil (including gas turbines), 12% hydro, 14% pumped storage hydro and the small remainder in nuclear. It is worth noting that the overall capacity of hydro and pumped storage plants is significantly greater in the SRB than in the DRB. Overall, the power plants of all types are more widely scattered over a considerably larger area in the SRB than in the DRB. In addition, topographical and river flow conditions are such that hydro plants have been located both in the high country near the beginnings of the Susquehanna River as well as in the lower reaches near the mouth. In the DRB, however, hydro plants have been located only in the most northerly portion of the basin, and even the pumped storage location is well within the northern half.

The relative concentration of power plant types is strongly related to availability of the fuel source. The fossil-fueled stations in the DRB inherently are concentrated along rail or sea river transportation facilities, and largely located between the cities of Trenton, New Jersey and Wilmington, Delaware with the greatest density in the vicinity of Philadelphia, where there are many petroleum refineries as well as a

rail head and transshipping facilities. As a consequence, the majority of plants operating in the DRB are fueled with oil.

In contrast, there are few fossil-fueled facilities in the lower reaches of the Susquehanna, but they are reasonably well associated with the major intermountain regions where coal is readily available. Petroleum or its by-products are much less a consideration in the SRB as fuel.

V.D. FUTURE POWER DEVELOPMENT IN THE ELECTRIC SERVICE AREA

V.D.1 FUTURE POWER DEMAND OPTIONS

The purpose of this section is to estimate, using our best judgement, the probable high and probable low growth rates which are likely to enclose the actual future growth rate, recognizing that the latter will essentially be the product of the decisions made by regulators and legislators. It is possible to generate many power demand scenarios, which quantitatively assess the influence of the causal factors on demand, with each being based on an explicit list of assumptions. However, it is not the objective of the scope of work to carry out the extensive and costly computer modeling of future demand which would be needed. Further, such a level of effort is not necessary to a visualization of future power development scenarios in the ESA.

During the 15 - 20 year period prior to 1974, electric power demand in most regions of the United States, including the electric service area, doubled about every 10 years; that is, the average electric power demand increased at a rate of 7.0 - 7.5% per year. This period can be generally characterized by the following causal factors which would tend to induce high power demand growth rates:

- Relatively high personal income growth
- Relatively high economic growth (products and services)

- Relatively high population growth
- A decrease in the real price of electricity when adjusted by the Consumer Price Index, and often a decrease in absolute prices
- An abundant electricity supply base that imposed no constraints on the growth of demand
- A general disinterest in methods for preventing inefficient and wasteful uses of energy in general, with consequent effects on electricity use, because no motivation existed to do otherwise.

These are the factors which have major influence on the demand for electricity. Assuming that past levels of economic and personal income growth are achieved in the future, it is of interest to examine the last four factors as to their effects on electricity demand in the electric service area assuming that government controls, which would tend to reduce electricity demand, are implemented only in a very low-key manner, if at all.

The population growth forecasts for the electric service area indicate that the "probable high" population increase will be about 37% from 1975 to 2000 (1.3% average annual). From 1960 to 1975, the actual population increase was about 26% (1.6% average annual). Thus, during the next 25 years, the probable high growth rate will be a little less than the actual growth rate experienced during the previous 15 years. Intuitively, one would expect this decreased population growth rate to dampen demand somewhat. Quantitatively, recent studies have shown that the elasticity of electricity demand with respect to population is about +1.0 (for example, Chapman, et al, 1972; Rand, 1972). An elasticity

estimate represents the percentage change in the electricity demand associated with a 1% change in the causal factor. Thus, a population increase of 1% causes a 1% increase in electricity demand. Similarly, a population decrease of 1% would cause a 1% decrease in demand. The reduced population growth in the electric service area during the next 25 years, therefore, can be expected to decrease the nominal 7.5% annual growth of electricity demand by nearly one half of a percentage point.

Natural market forces have already started to dramatically increase the real price of electricity as opposed to the decrease in real price which occurred during the previous 20 year period. The rapidly escalating costs for new construction of nuclear, fossil and other types of power plants, coupled with two to four fold oil price increases, are having significant effects on the price of electricity. The following table summarizes the results of several investigations as to the effects of price increases on elasticity of demand:

Table 5-5 Electric Price Elasticities Associated With Demand

	Residential	Commercial	Industrial	Total
(1) Chapman (1972	-1.3	-1.5	-1.7	
(2) FPC (1973)	not est.	not est.	not est.	-0.5
(3) Perl (1974)	-0.5	-0.8	-0.7 to -0.9	
(4) Rand (1972)	not est.	not est.	not est.	-0.85
(5) Mount (1973)	-1.2	-1.36	-1.82	

On the basis of these studies, it seems clear that price increases do indeed have an effect on reducing demand, although there is uncertainty as to the quantitative amounts of such reductions. One reason is that the pre-1974 studies were not able to anticipate the dramatic gas and oil price increases which have occurred; consequently, the elasticities shown above are somewhat high. For example, a 10 percent price increase reduces residential demand by 5 percent according to Perl (1974), whereas the same price increase reduces residential demand by 12% according to Mount (1973).

There are many estimates as to future electricity price increases caused by natural market forces. It does not appear necessary to discuss these in any depth, because it is clear that real price increases are occurring now and can be expected to continue. Therefore, the nominal 7.5 percent annual growth of past electricity demand will be dampened somewhat in the future as a result of natural price increases.

Another important factor which requires evaluation as to its effect on future demand is whether or not the supply base can keep pace with the relatively unrestrained demand which typified the past. The thermal power plant boom which started after World War II effectively allowed demand to grow without constraints, and the promise of nuclear power in the early 1950's reinforced the notion that supply could easily keep up with demand. This situation continued through the 1950's and 1960's; however, serious re-evaluation at all levels of government and industry started taking place in the early 1970's. It was becoming apparent that

potentially significant constraints on the expanding electric supply base were emerging. Some of these constraints are:

- Increasing concern with environmental effects; that is, there could be a near future time when the environment simply would not be able to absorb the exponentially increasing numbers of plants and their attendant environmental effects.

- A growing lack of confidence in nuclear power because of problems related to safety and radioactive wastes.

- Recently, significant uncertainties as to the ability of the electric utility industry to finance the construction of costly nuclear and fossil plants has added a restraint factor to the installation of such plants on a large scale basis.

The "national energy policy" of the 1950's and the 1960's was based mainly on nuclear energy as the future primary source of electric power. The funding of research and development for alternate energy conversion technologies was only on a very low priority basis. Today there are doubts by many public and political leaders that the nuclear option will pay off on the schedules previously set, although nuclear expansion is, in our view, still favored. Accelerated R & D programs on the alternatives are expected tc provide real payoffs during the last 10 - 15 years of this century. Nevertheless, there are significant uncertainties associated with the capability to expand the future supply base to keep up with a future demand requirement which is as high as that of the past. These uncertainties are expected to have an important effect on reducing previous demand growth, particularly during the next 10 - 15 years.

With an abundant energy supply base during the 1950's and 1960's, neither

the government, industry, or individual consumers had real reason to be motivated in the area of conservation. However, as a result of the factors discussed above, the desire to conserve is emerging. Conservation policies could be applied in the future on a low-key basis, which might be characterized by "voluntary" conservation practices with only minimal government controls and incentives to encourage such practices, or they could be applied in a forceful manner by establishing significant government controls to maximize conservation. Even on a low-key basis, however, it can be expected that conservation practices will have an effect on reducing future demand.

On the basis of the above discussions, it is likely that the future demand for electricity could take place at a lower growth rate than that occurring during the previous 20 years, while maintaining the same relative growth in the economy and personal income experienced during the previous period. Two comprehensive studies support the notion that energy growth and economic prosperity can be de-coupled to a large extent. The Energy Policy Project (1974) states "our research indicates that energy growth could be reduced while growth continues in the output of goods and services - without sacrificing national economic goals." Rand Corporation (1972) also suggests that lower electricity growth rates can be achieved with only minimal adverse short-term effects, and essentially no long-term effects on economic growth. On the other hand, The Institute for Contemporary Studies (1975) in "No Time to Confuse" questions the de-coupling of energy growth and economic prosperity.

The factors discussed thus far indicate that several important "natural forces" will be acting to reduce the future power demand growth rate. However, there is one potential off-setting factor which could be very important. It is possible that gas and oil shortages will become so acute that end use substitution of electricity for them is necessary. Electrification of the transportation industry (automobiles and trucks in particular), building space heating, and certain industrial processes are areas where substitution of electricity could be significant. For example, if an electric heat pump is operated using electricity from coal-fired or nuclear plants, it can be shown that for each 1.6 heat units generated in the power plant about one unit of useful heat can be supplied to a building or home. On the other hand, pipeline transmissions and furnace efficiencies for natural gas are such that over 2.0 heat units must be provided at the source to supply the same unit of useful heat at the end use point. Thus, space heating using electric heat pumps could represent significant conservation of oil and gas. It is obviously difficult, if not impossible, to quantify the potential future effects of an "electric economy." Such effects would occur gradually, but could have a significant influence to increase demand growth, thus off-setting decreases in growth achieved through conservation.

Probable High Demand in the Electric Service Area

Based on the preceding analyses, it is clear that no mathematical method can be completely relied on for accurately quantifying a "probable high" electric power growth rate during 1975-2000. During 1964-1974 the peak

power demand in the service area increased at a 6.7% average annual rate.* This rate can be considered a high one, but not necessarily the "high" for future years. As the preceding discussions point out, there are important reasons why the electric past could be very different from the electric future. It seems reasonable that various growth reduction factors could reduce the past annual increase rate of 6.7% by around 1.5 to 2.0 percentage points, resulting in a future high between 4.7 - 5.2%. Making some allowance for the potential effects of future electrification, it is proposed that the "probable high" power demand rate during 1975 - 1990 be 6.0%. As a matter of judgement, it is assumed that voluntary type conservation practices would lead to even further reductions in later years; accordingly, the "probable high" growth rate during 1991 - 2000 is assumed to be 5.5%. It should be emphasized that the projected demand in 2000 is not sensitive to changes in the growth rate on the order of ±1.0 percent because the scenario evaluations do not require a precise estimate, even if it were possible to make one.

It is of interest to compare this forecast with "high growth" forecasts which have been made recently by others.

*Note, however, that the average annual rate during 1964 - 1973 was 8.2%. 1974 peak demand was 6% less than that in 1973.

Table 5-6 Annual Growth Rates (%)

Forecast	75-80	81-85	86-90	91-95	96-2000	Reference
(1) "Historical growth" case	6.81	6.81	5.0	5.0	5.0	Energy Policy Project (1974)
(2) Dept. of Interior/ FPC	7.1	6.65	5.3	5.3	5.3	Dupree (1972)
(3) FPC-Unrestrained Case			5.9			Task Force on Fore-cast Review (1973)
(4) FEA		6.0				Federal Energy Admin. (1974)
(5) California High Growth	6.52	6.7	6.08	5.76	5.63	Rand (1972)
(6) Cornell - NSF Workshop	6.3	6.3	6.3	6.7	6.7	Cornell (1972)

(Note: The above growth rates were calculated using data in these references)

The major assumptions for each of these forecasts is that future electrical growth will be based on conditions similar to those of the past; that is, high economic growth, high income growth, and mimimum-type conservation efforts.

Probable Low Demand in the Electric Service Area

Many of the preceding considerations are applicable to the development of a "probable low" power demand forecast, but with a different degree of emphasis. With regard to the "probable low" population growth, forecasts indicate that the population will increase about 14% between 1975 to 2000 (0.5% annual average), compared to the actual 1960 - 1975 increase of 26% (1.6% annual average). Thus, during the next 25 years the probable low growth rate will be about 1.0% per year less than the actual growth rate during the past 15 years. This 1.0% reduction corresponds to an

approximate 1% decrease in future power demand, based on the earlier discussion of population elasticity.

With regard to the cost of electricity, the imposition of price increases in addition to natural market place increases would be significant in lowering demand. It is clear from Table 5-7 that price increases could be implemented so as to achieve nearly any demand objective. Since utilities must install new capacity to keep up with peak demand increases, peak load pricing policies could be devised to transfer heavy consumer class demands away from the peak. Peak load pricing would have the effect of dampening the peak demand growth rate, but could still allow about the same total energy usage; i.e., the system load factor would increase.

Peak load pricing could be thought of as having two components. One would be to charge each consumer class (residential, commercial, and industrial) for its proportionate share of the energy and capacity during peak demand periods. Significant modifications to present utility rate structures would be needed to carry out such a policy, because most utilities charge small users more per kwh (residential) and charge large users less per kwh (industrial), regardless of which has the larger share of peak demand. The second component consists of a penalty on peak demand users to discourage unnecessary consumption. This penalty might take the form of a tax on the quantity of kwhs consumed during the peak demand period. Pricing policies have more potential for reducing demand to desired levels than any of the other available methods.

Table 5-7 POLICIES FOR SLOWING THE GROWTH RATE IN ELECTRICITY CONSUMPTION

	Policies that Affect Prices		Nonprice Policies	
	of Electricity	of Appliances	Voluntary	Proscriptive
Initiate consumer education programs				
Basic conservation practices			X	
Efficiency labeling of appliances			X	X
Provide tax incentives				
Encourage energy efficient building design		X		
Encourage solar heating		X		
Encourage more efficient appliances		X		
Change electricity rate schedules				
Increase rates	X			
Change rate structures	X			
Peak load pricing	X			
Restrict promotional activities				
Advertising			X	X
Builder promotions			X	X
Appliances			X	X
Change building codes				
Tighten insulation standards				X
Heat-reflecting glass				X
Minimize internal heat source by venting				X
External sun shades				X
Impose taxes as disincentives				
On electricity sales	X			
On electrical appliance sales		X		
On incandescent bulbs		X		
On peak loads	X			
Restrict selected uses of electricity				
Heating, cooling, water heating, cooking, clothes drying, refrigeration			X	X
Restrict issuance of new building permits				X
Undertake long-term rationing				X

Source: Ra d, 19 2

In addition to effects on demand of the "probable low" population forecast and new pricing policies, potential problems of expanding the supply base are important as to their effects on restraining demand growth. Consider the scenario characterized by a significant slowdown in nuclear plant construction, increasing scarcity of fossil fuels for power plant boilers, and slower development than expected of alternative generation methods because of technical and economic problems. For such a scenario, power demand would be constrained to grow slowly, if at all, for the period of power supply shortage. This situation could occur during the 1880's. Obviously, it is not possible to quantify such effects without a study effort well beyond the work scope of this review.

Proscriptive conservation policies also have great potential for slowing the growth rate to "probable low" demand levels. This must be true because the voluntary energy conservation appeals in some regions of the country in late 1973 resulted in actual energy use reductions of up to 10 percent of projected utility energy loads. However, these reductions had minimal effect upon peak demands (FPC Bureau of Power, 1974). Estimates of energy savings using both voluntary and mandatory measures have also been made. The Mid-Atlantic Area Council (MAAC), which coordinates power in the Pennsylvania - New Jersey - Maryland (PJM) interconnection area (the major part of the defined electric service area), estimated that the projected net system generation during December 1973 through December 1974 (1.76×10^{11} kwh) could be reduced by about 8.6 percent if the following procedures were adopted (FPC Bureau of Power, 1974):

1. Curtailment of non-essential heating and lighting load at utility-owned power plants and office facilities.

2. Curtailment of non-essential generation station auxilaries at power plants.

3. Appeals to large commercial and industrial customers to curtail non-essential use.

4. Appeals to the public to curtail non-essential use.

5. Interruption of contractually interruptible load.

6. Reduction of system voltage.

7. Reduction in use of electricity by governmental entities due to reductions or changes of usage in governmental facilities, building, street illumination, or others.

8. Reduction in hours of operation of commercial centers.

9. Reduction in use by industrial customers whose output is not essential to the public health and safety.

10. Elimination of outdoor night-time sporting events.

11. Elimination of outdoor commercial advertising displays.

12. Other methods.

It is not being recommended herein that these measures actually be applied because many of them are undesirable, and should not be implemented except under emergency conditions. However, it is clear that strict conservation measures can significantly reduce demand without causing complete dislocation.

Many recent publications have detailed both voluntary and proscriptive energy conservation policies (for example: Rand 1972, Hammond, et al, 1973; Office of Emergency Preparedness, 1972; FPC Bureau of Power, 1974). Table 5 is a summary of four types of policy options which, if applied on a selective basis to achieve defined objectives, would have a major effect on achieving growth control.

Using solar energy in place of electricity to provide hot water heating and space conditioning for buildings can be classified as a conservation method, yet it deserves special attention. Solar substitution could have a significant effect in reducing future summer peak loads in the electric service area. Experimental installations have been made in many areas of the country, and technical feasibility has been demonstrated. Economic viability may still be questioned, but it can be expected that solar substitution will soon be economically competitive with electricity as further refinements in the technology are made. Federal research and development funding in this area alone will increase from $1.7 million in 1975 to an estimated $4.1 million in 1975 and $21.6 million dollars in 1976. The nearly thirteen-fold increase from 1974 to 1976 indicates the high priority being given to solar substitution, and this does not include the additional research being conducted by the electric utility industry. Thus, it can be expected during the 1980's that peak electricity demands will start to be gradually reduced as solar substitution technology is phased in.

In summary, the factors which would influence a "probable low" growth rate in the electric service area are:

- Lower population growth in the future than in the past.
- Restructuring the price of electricity, with emphasis on peak load price increases.
- The inability to add new power generation to the existing resource mix at the same growth rate of the recent past.
- Implementing energy conservation policies in a significant way using both voluntary and proscriptive measures.

- Solar substitution for electricity in the areas of hot water heating, space heating, and space cooling.

As in the analysis of the "probable high" power demand, it is not possible to accurately quantify the "probable low" demand. However, it is clear that policies could be implemented to effect substantial growth rate reductions relative to the growth rate of the past. It appears reasonable to use, for purposes of the scenario evaluations, an average annual growth rate of 3.0 per cent during 1975 - 1990 and 2.5 per cent during 1990 - 2000. These growth rates are probably near the lower limit at which some effects, perhaps undesirable, on overall economic growth would occur. These rates are considered to be achievable if strong policy actions are taken in the areas of electricity price increases and conservation. Based on the types of governmental controls which would need to be implemented to reduce power growth rates below the 2.5 - 3.0 per cent level, there is no evidence yet that the public is willing to accept the potential changes such controls could induce in American life styles and the free enterprise system. For example, the Institute for Contemporary Studies (1975) offers thought-provoking analyses as to whether the low growth energy policies put forth in the Energy Policy Project (1974) are compatible with the free enterprise system and many other basic values and freedoms which Americans hold dear.

The Energy Policy Project and Rand Corporation analyses of "low growth" cases are given for comparison:

Table 5-8 Annual Growth Rates (%)

Forecast	75-80	81-85	86-90	91-95	96-2000	Ref
(1) Technical Fix	3.31	3.31	2.43	2.43	2.43	Energy Policy Project (1974)
(2) Zero Energy Growth	3.0	3.0	1.67	1.67	1.67	Energy Policy Project (1974)
(3) California - Low Growth	3.28	3.31	3.0	3.0	3.0	Rand (1972)

The "Technical Fix" growth case assumes that energy conservation practices and known energy-saving technologies are incorporated into production and consumption patterns to the extent possible within existing life styles and economic organizations. The "Zero Energy Growth" case assumes that, in addition to the "Technical Fix" measures, changes in life styles and economic structure are introduced in order to move towards a situation of constant per capita energy consumption. The "California Low Growth" case assumes that the future fossil fuel situation is critical, a nuclear slowdown occurs, significant electricity price increases occur as a result of conservation taxes and peak-load price increases, and there is a general economic slowdown.

Summary

After consideration and study of the many diverse factors which will influence future power demand, it is believed that using the growth rates in the following table appropriately depict the "probable high" and "probable low" future power demand levels:

	1975 - 1990	1991 - 2000
Probable High	6.0	5.5
Probable Low	3.0	2.5

Average Annual Growth (%)

These growth rates have been used to forecast the peak demand in the year 2000 based on the 1974 summer peak demand in the ESA of 31,900. Figure 4 shows these forecasts, and indicates that the probable high peak demand in 2000 is approximately 138,500 MWe and the probable low peak demand in 2000 is approximately 65,600 MWe.

It is important to note that a "most probable" forecast has not been made. The most probable demand in the electric service area will be that which is affected by future regulations, standards and institutional constraints. The service area regulators, influenced by public and political pressures, will establish constraints in a manner to achieve the desired power demand objective (i.e.The "most probable" demand). There does not appear to be a valid reason, or even basis, for "guessing" how and when such constraints will be imposed. The Chapter V analyses are intended to be objective evaluations of potential power development strategies; however, making a "most probable" forecast is a subjective undertaking.

V.D.2. FUTURE POWER SUPPLY ALTERNATIVES

The purpose of this section is to briefly summarize the current state-of-the-art as to some present and future alternative methods for generating electricity. The current status, potential problems, and expected commercial application of various technologies which could affect the future electric service area resource mix will be discussed. Potential undeveloped hydroelectric and pumped storage sites in the electric service area will also be discussed. Power plant cooling methods are discussed in the last section of this chapter.

Perspective is gained on the emphasis being given to advanced technologies in various stages of development by a review of the funding being allocated by the federal government and the electric utility industry. Table 5-9 gives a breakdown of current and projected funding for both present and emerging energy conversion technologies.

Following are brief discussions of promising fuel and energy conversion technologies.

High Temperature Gas Reactor (HTGR)

A number of high temperature gas-cooled reactors using a steam cycle are currently being operated or are planned. These include the Fort St. Vrain, 330 MWe HTGR (operating), and larger units being planned by several utilities.

PROBABLE HIGH & PROBABLE LOW DEMAND FORECASTS

ELECTRIC SERVICE AREA

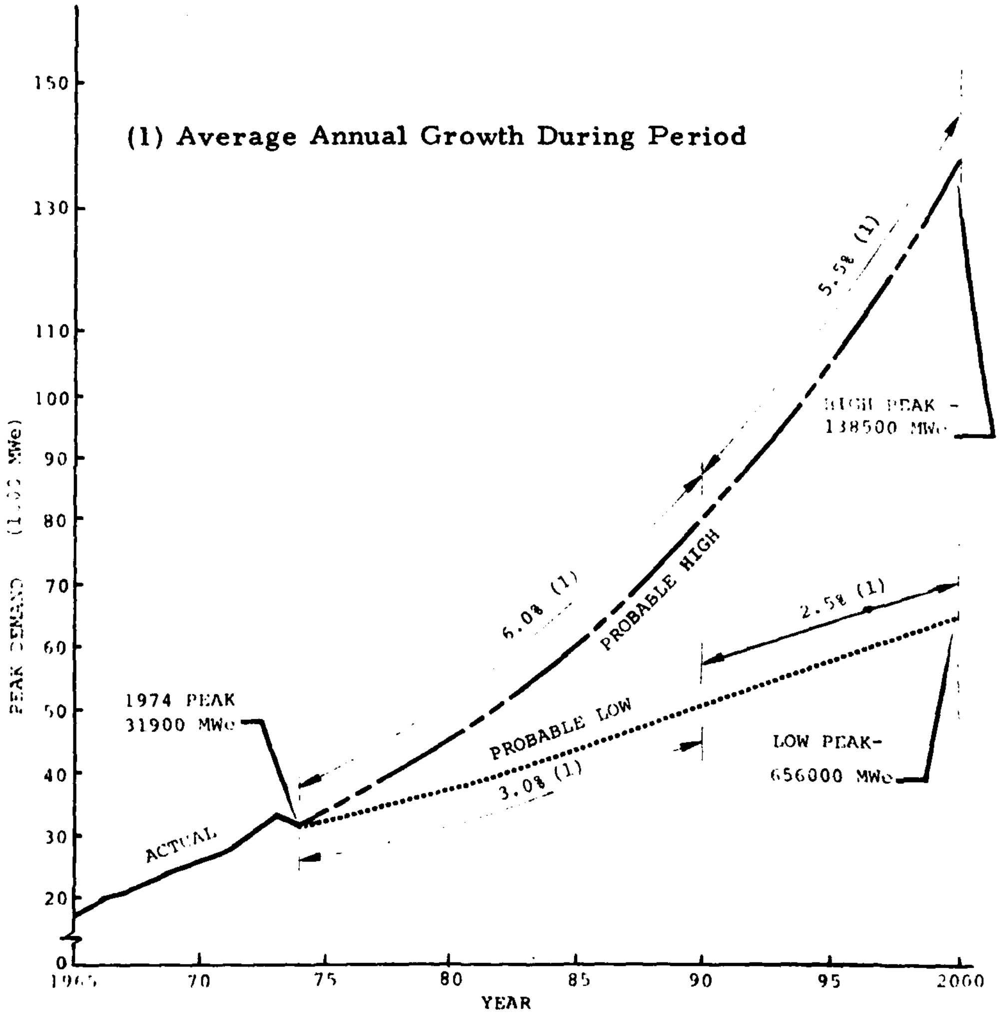


Table 5-9

FUNDING ($1,000's) FOR TECHNOLOGY R & D

	ERDA (1)			EPRI (2)	
	1974 Actual	1975 Est.	1976 Est.	1975 Est.	1976 (3)
(1) SOLAR ENERGY					
- Solar energy for buildings and facilities	1720	4070	21600	620	
- Solar thermal power plants	885	1500	11000	740	
- Photovoltaics	666	1500	10000	420	
- Wind energy conversion	566	1000	9000	500	
- Other (Bioconversion, ocean thermal)	100	700	5500	720	
Sub-Total - Solar R & D	3937	8770	57100	3000	
(2) FUEL CELLS	-	500	500	3925	
(3) MHD	2815	7584	13773	- Incl with (5)	
(4) ENERGY STORAGE SYSTEMS (Includes batteries, flywheels, compressed air, other storage R & D)	1689	5800	9100	3582	
(5) ADVANCED CYCLES (Includes MHD, heat pumps, advanced concepts, high temp. gas turbines)	--------Unknown------			4900	

(continued next page)

Table 5-9 Continued

(6) <u>HYDROGEN</u>	----Incl. with (4)---			565
(7) <u>GEOTHERMAL</u>	6231	13800	28370	2800
(8) <u>FUSION</u>	52968	85030	120000	4890
(9) <u>NUCLEAR FISSION</u>				
- LMFBR	193019	250023	261300	3250
- LWR	25791	30300	31900	29700
- Gas cooled reactors	12590	21893	31400	3250
(10) <u>FOSSIL ENERGY DEVELOPMENT</u>				
- Coal gasification	37857	80149	94509	12160
- Coal liquefaction	19764	54632	96897	8377
- Oil shale	2780	3454	8147	-
- Direct utilization	-----Incl. above----			3750
(11) <u>END USE ENERGY CONSERVATION</u>	-	-	3000	Unknown

<u>NOTES</u>:

(1) ERDA - Federal Energy Research and Development Administration (Source: Nucleonics Weeks, February 6, 1975)

(2) EPRI - Electric Power Research Institute-(R & D for the electric utility industry) (Source: EPRI 1975 Program Emphasis)

(3) EPRI - 1976 information not available until November, 1975

The HTGR with a steam cycle has a thermal efficiency of about 39% as compared to the light water reactor's (LWR) 32%. This efficiency increase results because the HTGR produces steam at high temperature and pressure equivalent to a modern fossil-fueled plant. Thus, the cooling water requirements are about 25% less for the HTGR in comparison to the LWR for the same electrical output.

It is expected the industry will see greater use of large sized HTGR units in the future. Standardization of the HTGR nuclear steam supply system is underway. The trend is toward larger and simpler units and a major effort is underway to develop a 1500 MWe HTGR designed to meet the needs of large operating utilities. The new, larger HTGR steam units could make a significant contribution to the economic production of electrical power by 1990.

Gas Turbine HTGR

Instead of using a steam cycle, helium is heated in the HTGR core and then passed through a gas turbine to produce pwer. A significant advantage of this technology is that the cycle is compatible with a dry cooling system at reasonable costs. The reason is that the gas turbine rejects its heat over a band of temperatures, typically from about 350° F down to 100° F, whereas the steam turbine must reject all of the heat at the same temperature. This steam condensing temperature is typically 140 - 150° F. The increase in temperature difference means that the dry cooling

towers can be much smaller and require less air flow as compared to using such towers with a steam cycle plant. It is expected that present development of the gas turbine HTGR will allow commercial introduction by 1990.

Liquid Metal Fast Breeder Reactors (LMFBR)

For all intents and purposes, a breeder reactor is one which takes the energy from a fission reaction to create heat for power production while optimizing the alteration of so-called "fertile" materials such as Th^{232} and U^{238} to other fissionable materials that can be stripped out during the fuel reprocessing which follows "burnup" and used to fuel a second line of reactors.

Since the easily fissionable isotopes U^{235}, TH^{233}, Pu^{239} can be caused to split by neutrons of virtually any energy, and since there is a material advantage in "breeding" fissionable isotopes by allowing a high density of high energy neutrons, the use of hydrogen containing materials in the reactor to moderate the energy of the neutrons is no longer needed. Nor is it necessary to work at the relatively low temperatures required by water or organic moderated reactors.

Consequently, use of heat transfer fluids that can operate at high temperatures can be used. Liquid metals are the most readily available materials that can be circulated under those circumstances and that will serve the purpose, so the breeder reactors are currently being developed with liquid metal coolant.

The LMFBR permits use and consumption of all Uranium and Thorium, assuring a supply of nuclear fuel for centuries. However, these elements are not abundant in limitless quantities at concentrations that can be economically mined, milled and concentrated at this time. The Natural chemistry of these elements is important in their concentration. One of the reasons Uranium has been developed in nuclear technology over Thorium is the ready accessibility of the element as a water deposited concentrate in sediments that are reasonably easy to mine and process. Thorium on the other hand is contained in natural minerals, derived from igneous rocks, that are exceptionally resistant to weathering and generally found as natural concentrates as the so-called monozite sands or in rarer concentrates of Zircon.

By and large, a relatively large source of these radioactive fuels exist in igneous rocks with an average in unweathered volcanics of about 1 part per million Uranium. The Thorium concentration generally holds a consistant ratio to that of Uranium of about 3 times. Somewhat higher magnitudes of concentrations are found in granites, metamorphics and hydrothermal veins because of local high temperature concentration effects.

Consequently, the future of both thermal and fast neutron reactors using Uranium or Thorium as fuels depends largely on the effect of market demand on both reactor and mining/milling technology. It is unlikely

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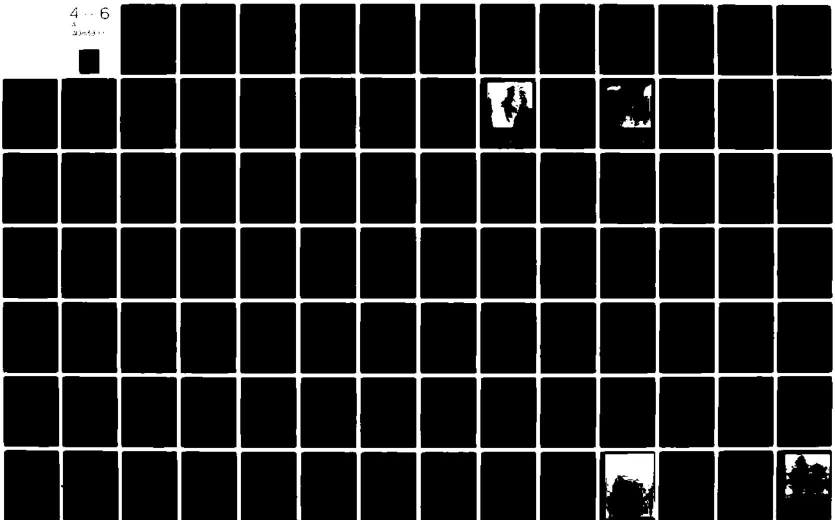

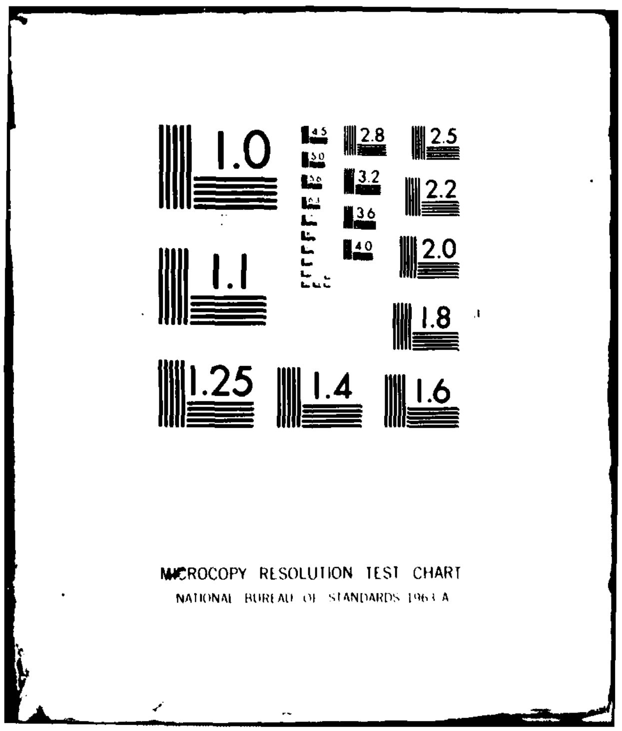
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that other substantial deposits of either fuel will be found in concentrated form, and the foreseeable future for such fuels is probably that of exhaustion in the first few decades of the next century. Utilization of the breeder concept is wise, for it leads to greater utilization of the whole fuel that is available and use of the high temperature attainable by using a liquid metal heat transfer mechanism permits a much higher efficiency in producing steam and, of course, electric power. It is a viable power source for the foreseeable future, although many of the problems which are troubling the installation of light water reactors will also have to be faced by the LMFBR.

Fusion

The use of the nuclear fusion process as a means of generating electricity is currently under investigation and has been since the technology was developed for explosive release of the energy in nuclear bombs. Fusion of elemental nuclei can only occur if the momentum obtained by the nuclei can overcome the repulsive forces between them and a collision is brought about. Theoretically such action should be possible for most any element, but from a practical standpoint only hydrogen isotopes are currently being used.

In order to force the hydrogen isotope nuclei into close enough proximity to release energy as they "fuse" to isotopes of helium, they must be contained under tremendous pressure while being energized (usually by heating) to about ten million degrees. The research being undertaken presently centers around an attempt to contain the isotopes of hydrogen

as ions in a so-called "magnetic bottle" while heating them by various means. The problems are that at the required temperatures and field strengths the "bottle" leaks or collapses before the reaction can be set into self continuity.

The advantages of the process are thought to be so great as to outweigh the exceptional problems of bringing about a continuous, controllable fusion reaction. The fuel is widely distributed as a natural fraction of water everywhere on earth, and with the right equipment, is reasonably easy to refine to useful concentrations. Consequently, fusion of Tritium or Tritium-Deuterium, both of which are hydrogen isotopes, are seen as the most likely fuels.

While projections of having a working reaction by the early 1980's are encouraging, the shift from a millisecond burn (at present) to one second burn (soon hoped for) and finally to a continuous burn (sometime in the future) is still at "laboratory" level evaluations. Stepping from there to pilot plant and finally commercial production presumes a great deal, for there is no available technology to support such a development. Based on the requirements for developing the fission nuclear power plants to the point of reliable operation (if this indeed can be said to have taken place), it can be expected that at least 20 years will be required after the prototype is built. The potential of fusion before the year 2000 in any form other than a curiosity seems unlikely.

Magnetohydrodynamics

MHD is a direct conversion method for producing electricity. High temperature gases formed by the combustion of fossil fuels, are passed through a channel (MHD generator) within a magnetic field. By seeding the gases with potassium or cesium salts, they are ionized and become electrically conductive. In effect, the electrons are collected on the inside channel surfaces, and electricity is produced for transmission from the MHD generator. Current research is directed toward developing materials to handle the hot gases, improve the magnetic field, recover the seeding salts, and eliminate the sulfur and nitrogen oxide pollutants in the exhaust gases.

The first application of MHD will be to combine it with a conventional steam cycle generator. The exhaust MHD gases still contain a large amount of heat and can be used to fire a steam generator. MHD used as a "topping" unit for the steam cycle increases the overall efficiency by some 10 - 15 percent. This combination is analogous to the use of gas turbines with a steam cycle to form a "combined cycle" plant.

Fuel Cell Technology

Efforts to develop modern hydrogen oxygen fuel cell technology for the power program have been pursued. Gemini space missions also have used hydrogen oxygen systems for electric power.

In the 1960's development of low temperature fuel cells was begun. These systems used methanol, formic acid and hydrazine. Direct

oxidation of carbonaceous fuels is difficult to achieve with an efficiency as high as with the oxidation of hydrogen; hydrocarbon fuels can be reacted with steam to produce hydrogen rich gas for consumption in fuel cells. Such systems have been investigated in the last decade by various groups in the U.S. and Europe.

Indirect oxidation of carbonaceous fuels has been investigated. Several systems have been developed for use with either high or low temperature fuel cells and have exhibited good performance. Major efforts in this area started 1967 with the first phase which has become a six-year, 50 million dollar program. This effort is presently being sponsored by 31 gas utilities which have the goal of developing fuel cell systems using natural gas (methane) as the fuel.

Attention is currently being focused on efforts to use fuel cell systems to generate large blocks of electrical power. Generally two alternatives are being pursued. One for the central power station application and the other for dispersed generation of electric power in substations. Work on the central station application is still in the laboratory and systems study phase and practical field hardware has not yet been built. Westinghouse Electric Corporation has been engaged in some development work and has prepared a preliminary design for a 100 KWe electric system based on gasification of coal and a high temperature Zirconium electrolyte fuel cell. Pratt & Whitney announced in December 1973 a $42 million co-operative program with nine electric utility companies to develop a 26,000 KWe fuel cell. Energy system concepts using the thermal and electric

output of nuclear reactors to produce hydrogen from the disassociation of water is currently under investigation.

Fuel cells have potential operational problems associated with the redistribution of catalyst, with the resulting reduction in the effect of reaction surface area. In addition to this dominant degradation mechanism, there is also a finite solubility of catalyst in the electrolyte which further reduces the active surface area. The secondary life limiting phenomena is corrosion of the seal and current collection compounds.

If fuel cells are to be economically applied to central station energy generation, the current useful cell life must be extended beyond the 3,000 to 20,000 hours presently available. The fuel cell unit design must also be improved so as to be suitable for the high volume production techniques required to supply thousands of cells per system, which will be necessary for electric generating systems in the multi-megawatt range.

Fuel cell systems will not be applied to any significant extent to central station power generation until economic advantages have been realistically demonstrated. This will require development of engineering experience and cost reductions in a number of areas.

The state of technology of fuel cells was expanded in the 1960's and is probably sufficient for the initial prototype fuel cell demonstration plants. The economic and operating lifetime characteristics of the fuel

cell will limit the feasibility of the fuel cell systems for central station or dispersed power generation in the near future. Because of the availability of coal and uranium reserves, the principle development emphasis will be on the fuel cells using fuels that can be readily produced by gasification of coal or from nuclear reaction processes.

Utilization of fuel cell technology seems to be compatible with planning concepts which center around the near term use of coal and the long term use of nuclear energy. This technology could also be a key factor in the "hydrogen energy economy".

Solar Power

Methods for utilizing solar energy for generating electricity are basically of two kinds; (1) using arrays of photovoltaic cells in terrestrial locations or in an orbiting space station, and (2) photothermal conversion of solar radiation to heat energy and subsequently to mechanical and electrical energy. The first method could become economically feasible if cells costs could be reduced by a factor of at least one hundred, but even so certain technical difficulties need to be solved. The more promising approach is the second method, which is now technically feasible and shows promise of being economically feasible.

The Federal Energy Research and Development Administration (ERDA) and the Electric Power Research Institute (EPRI) are dramatically increasing the funding of solar and wind power research. For producing electricity, the central receiver system looks very promising. In this design,

pressurized water flows to a receiver located at the top of a tower in the center of a circular field of heliostats, or thermal collectors. The water is transformed to steam and then drives a conventional turbine - generator. Other alternatives are also in advanced stages of research, and prototypes will be constructed in the late 1970's.

Several important problems are being worked on. Because collector efficiencies are still relatively low, a large number of collectors are needed. For example, it would require about 2500 acres of heliostats to generate 1000 MWe if the central receiver concept were used in the southwest. Thus, it would require significantly more collectors and land to generate this same power in the ESA, because the average solar radiation is much less. However, progress on this and other problems is being made, and it is expected that commercial solar thermal plants will be in operation in the 1990's.

Solar heating and cooling of buildings and hot water heating will have significant effects on reducing electrical demand in the 1980's. ERDA, EPRI, and other organizations have given "solar substitution" high priority, and it is now a matter of essentially refining the technology so that it is economically competitive.

Offshore Floating Nuclear Plants

Public Service Electric and Gas Company in New Jersey announced in 1972 their plans to have in commercial operation by 1980 a 1100 MWe offshore floating nuclear power plant. This nuclear power plant was to be

followed in 1981 by another 1100 Mwe unit, but the two units have been delayed until 1985 and 1987, respectively, because of anticipated reductions in future power demand and financial problems.

There are differing viewpoints on the environmental impact resulting from the construction and operation of offshore power systems. Risk of disaster such as ship wrecks, hurricanes, tidal waves, earthquakes, etc. as they might affect reliability and nuclear safety is of concern. In particular, with a nuclear power plant offshore, there is a concern that a nuclear incident involving radioactive materials would expose people to large doses of radiation. However, environmental studies completed so far on offshore plants suggest that the overall environmental and socioeconomic effects are less than those for land-based plants. Environmental reports and Safety Analysis Reports have been submitted to the Nuclear Regulatory Commission, as well as to the Corps of Engineers. There appears to be no question as to the technical feasibility of the offshore power concept, and a significant potential exists for using offshore floating plants.

Hydrogen Economy

With the ready availability of hydrogen containing compounds in the world (water, oil, coal, etc.), the use of hydrogen as a fuel has often been considered. Its advantages lie in its extremely clean burning and relative availability. Its disadvantages lie in storage and distribution problems. It is very explosive when mixed with air or other oxidants and much more chemically reactive, in general, than are the hydrocarbons;

and has a much lower energy release on a mole per mole basis than do the common hydrocarbons currently being used.

Hydrogen can be made by stripping it from the breakdown products of water or hydrocarbons that result from adsorption of energy delivered by heat, electrical discharge or electromagnetic radiation. It can also be produced, under reasonably controllable circumstances, as a by-product when water is used as an oxidant with hot carbon or certain metals. Commercial production by use of such means cannot be considered economic unless some other product of the reaction has commercial value and can help to underwrite the cost.

Perhaps the most economical production with present technology lies in the oxidation of coal using water as the oxidant, an old process leading to "coal gasification". Second in line is the hydrogen produced in and for fertilizer manufacture. It could also be produced electrolytically during offpeak operation by electrical power plants (with a similar justification to that used for pumped storage hydro, momentum wheels, etc.) by use of steam in the coolant lines of a high temperature gas cooled reactor or by intense radiation fields present in stored nuclear fuel waste. Technical problems of separation of the useful products before they recombine in the latter two techniques are manifold, however. Solutions to the safety problems of transportation of storage and use of hydrogen are in the offing. Use of metal or organic hydrides may make distribution by our present gas pipelines and storage systems feasible. In addition, advances in metal/non-metal technology can potentially lead

to better containment of this element or its flamable derivatives. However, in focusing on the production of hydrogen, the fact should not be missed that perhaps an even better fuel from the standpoint of heat product, ease of storage, transportation, and overall safety lies in the development of an alcohol economy. Use of methanol fired power plants has already reached the pilot stage, and was stymied only by the present scarcity of the material (largely produced from petroleum) due to the fuel crisis.

The prospects for the hydrogen economy are good, depending on the support given by federal and industry research. With the spin off in hydrogen handling technology from the space agency work, many of the problems may be considered at the "pilot plant" stage of solution.

Coal Gasification

The development of coal gasification is a sound plan for several reasons. First, it is not a new concept and use of methane/hydrogen mixtures for household or industrial use predated use of natural gas for such purposes. These gases were created by interaction of steam with ignited coal or coke. Second, almost the entire country is blanketed with pipelines that distribute these useful fuels. As an energy distribution network, it rivals that of the electrical system. Third, much of the existing economy is dependent on supply of gaseous fuels for power production, space heating and manufacturing processes. Fourth, hydrocarbon gases are a relatively clean fuel that do not lend themselves to pollution levels which have significant ecologic or social impact.

The advances in technology since the days of "coal gas" provides several potential means for gasifying coal to obtain different useful products as well as impurity levels. To begin with, it is certainly much more advantageous to gasify coal and use existing pipelines for distribution than it is to transport the coal across the vast distances involved. Modern requirements for low sulfur coal burning have placed curbs on many mines located nearer to the large demand areas and have required and will require massive upgrading of railroad beds in order to carry the loads of cars (weighing up to five times as much) and the length of "unit" trains.

It is also much more economically advantageous to install means for removing sulfur and other noxious constituents at a central location rather than to provide for individual removal techniques by the users which generally focuses on a more refractory form of the sulfur. Losses of sulfur in minor quantities at remote locations where population is scant and air diffusion is high can be tolerated better than at power stations in or near large cities. However, a potential problem with gasification at a central location (such as a mine-mouth plant) is that the process requires large quantities of water.

In the long view, the technology can be expanded beyond the coal fields to include tar sands, oil shales, carbonaceous shales, peats, etc., and the projection of energy availability from such geologically contained carbon/hydrocarbon concentrations is exceptionally high with available technology.

In conclusion, coal gasification appears to be one of the few viable means for solving the short-term power dilemma without requiring a massive research effort; by major alteration of existing distribution systems. The federal government and the utility industry are giving high funding priority to developing gasification processes for widespread commercial application.

V.D.3 FUTURE POWER PLANT SITING OPTIONS

In a previous section of this chapter, the existing resource mix of power plants was shown to be distributed in the following subregions of the service area:

- DRB subregion
- SRB subregion
- Coastal subregion
- Subregion consisting of areas in the ESA not included in the first three

Figure 1 defines the above subregions. It is appropriate to mention again that the coastal subregion includes the area east of the DRB, the Atlantic Ocean coastline, and the area offshore of this coastline.

One obviously important aspect in evaluating future power development in the ESA is to determine how the resources of these subregions can best be used to the greatest overall advantage. A prerequisite for designing a successful future siting strategy in the ESA is to first decide on the

allocations of new generating facilities to these subregions. After such allocations have been made, plans for developing the needed sites can be implemented with knowledge of objectives of the overall siting strategy in mind.

There are various efforts in the United States to centralize large amounts of generating capacity at single sites, as contrasted to siting individual plants on a number of sites. As an example, Pennsylvania in coordination with the state electric utilities is considering an energy park concept which would contain a mixture of nuclear and fossil plants. In this concept 10,000 to 20,000 megawatts of capacity would be installed in a single energy park. The study is in its early stages but candidate sites have been identified as a result of preliminary work. The benefits and potential problem areas attendant to locating large amounts of capacity in a single energy park have been identified. Examples of the benefits are the following:

- Effective, coordinated land use
- Minimized siting effort
- Power plant standardization
- Labor force stability

Some examples of potential problem areas are the following:

- Public acceptance
- Transmission facilities
- Availability of large amounts of water for cooling
- Site acquisition

In depth evaluations of the above areas need to be conducted at candidate park sites to assure environmental, technical and economic feasibility. Studies so far have indicated that the energy park concept appears to be a very viable method for the future siting of power plants, and the work in Pennsylvania will continue to the next steps of evaluation.

The potential for offshore siting of nuclear plants for providing power to the electric service area is considered to be very high, and is another area which needs to be discussed in this report. The engineering and licensing work already completed on Public Service Electric and Gas Company's offshore floating nuclear plant demonstrates the viability of this option. It is logical to aggressively develop offshore siting for power plants in any region where problems related to population density, limited cooling water supplies, geology or other problems make it increasingly difficult to find suitable land-based sites. Effectively using the Atlantic Ocean resource obviously represents a potentially great contribution to the future electric power needs of the service area. In the scenarios, 20 to 50 per cent of the year 2000 generating capacity was allocated to coastal and/or offshore siting areas. The effects on water consumption and numbers of sites needed in both the DRB and SRB are obviously decreased as use of the Atlantic Ocean for plant siting is increased. These results are explicitly shown in the scenario evaluations.

A purpose of Chapter V is to identify options for allocating future generating facilities, taking into account the differing resources and attributes of each subregion, but not to continue with the next step of indicating where within the subregion the facilities should be sited, as this is not within the scope of work. One approach which seems reasonable in initiating the identification of such options is to consider the present siting trends in the ESA and then establish a basis for siting future plants. This basis should include consideration

of the following:

- The quantities and types of plants, currently in commercial operation, which are needed to satisfy the future power demand in the electric service area.
- The quantities and types of plants which are expected to be in commercial operation at some future time and which will assist the present day technologies in meeting the future demand.
- The resources and attributes of each subregion which lend themselves to accomodating present and future generation technologies.

After consideration of the above factors, for example, it might be determined that a balanced siting program is achieved if 30 percent of the total estimated generating facilities in 2000 were located in the DRB, 30 percent in the SRB, 20 percent in the coastal region, and 20 percent in the remaining ESA areas. As in the cases of future power demand and the makeup of the future resource mix, there is uncertainty associated with attempts to project how future plant siting will occur.

This uncertainty can be addressed by using the eight scenarios identified in the introduction. The "1" series represents probable low siting in the DRB. The future range of siting uncertainty is thought to be adequately covered by the following breakdowns:

ESA Subregion	Probable High Siting in DRB	Probable Low Siting in DRB
DRB	30%	15%
SRB	30%	15%
Coastal	20%	50%
Other	20%	20%

Percentage of year 2000 capacity within subregion

About 23 percent of the total electric service area capacity is presently located in the DRB; therefore, using 30 percent as the probable high and 15 percent as the probable low encloses the case of extending the present trend. The siting variable is nearly independent of the energy supply mix; that is, each ESA subregion can accommodate the types of plants which will be used to meet future demand, except that hydro and pumped storage would be mainly in the DRB and SRB.

Rough estimates have also been made of the total numbers of nuclear and fossil sites needed in the ESA subregions. It has been assumed that, on the average, each fossil site could be developed to an ultimate capacity of 1000 to 2000 MW and each nuclear site to an ultimate capacity of 2000 to 4000 MW. Based on the capacity projected for each region by 2000, the sites needed are shown in Tables 5-10 through 5-17. These estimates of the sites needed in each scenario are based strictly on judgement, and are not intended to represent the results of a careful study. If energy parks were to be developed in the ESA, the numbers of sites needed would be significantly reduced.

Another important variation involves the number of present and future thermal plants which must use evaporative cooling methods instead of once-through cooling as a result of the Environmental Protection Agency's (EPA) new regulations (EPA, Oct 1974; EPA, Sept 1974). In their effect on future water consumption in the ESA, these regulations create additional uncertainty which requires evaluation. If they are stringently implemented, it is possible that the future cooling tower to once-through

ratio could be on the order of 3:1, with higher power plant consumptive water loss. That is, three thermal plants would be using evaporative cooling for every plant using once-through cooling. If they are implemented in a liberal sense, perhaps the ratio might be more like 1:1. If the law is changed on the basis that cost and water consumption outweigh water-related environmental effects, the ratio could be on the order of 1:3, with decreased power plant consumptive water loss. Since it is not at all clear which route will be followed, both the high and low ratios are evaluated in the scenarios.

V.D.4. THE ELECTRIC UTILITIES FUTURE DEMAND, SUPPLY AND SITING PROGRAM

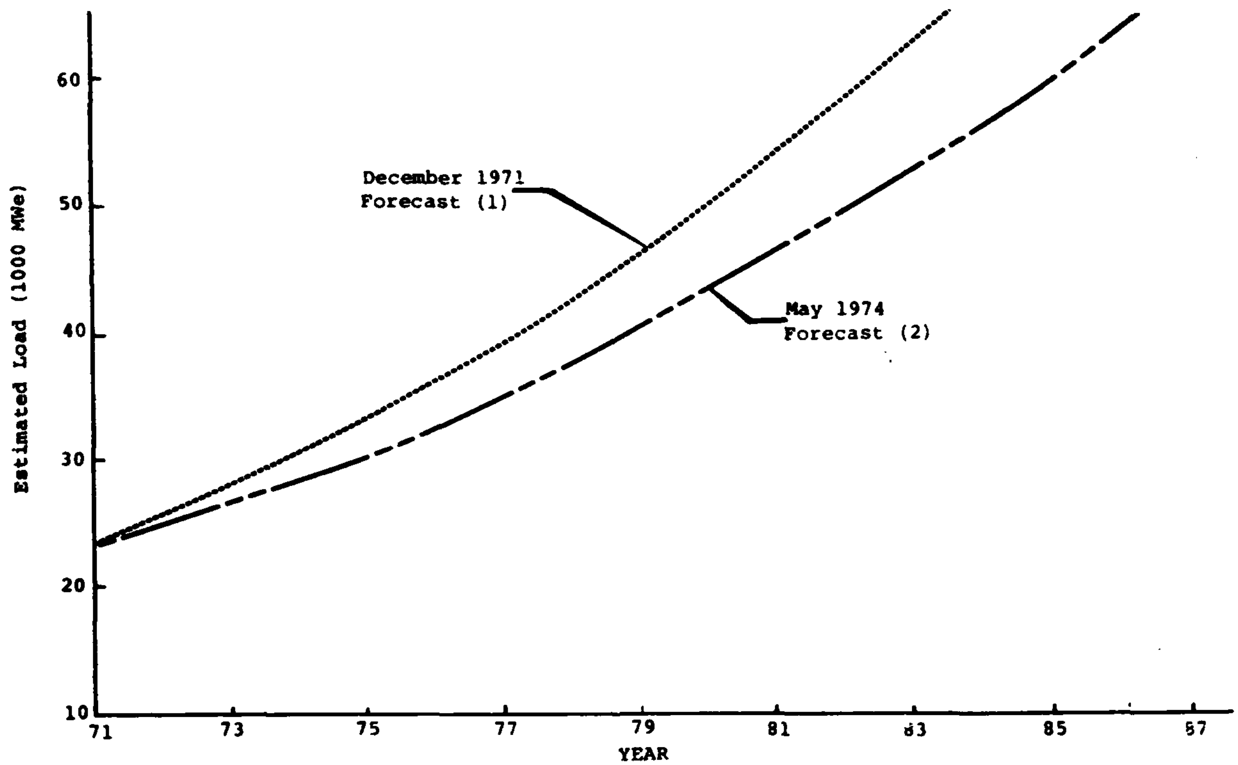
This section provides, in effect, the electric utilities scenario for the next 15 years. As a result of the many factors which have been influencing future power demand, the utilities' forecasts have been changing in the face of great uncertainty. Figure 5 shows the 1971 and 1974 load forecasts made by the Delaware River Basis Electric Utilities group which represents the major portion of the defined ESA. During the 15 year period 1971 - 1986, the 1971 study forecasted an average annual growth rate of about 7.7%. During the 15 year period 1973 - 1988, the 1974 study forecasted an average annual growth rate of about 6.5%. The utilties are preparing new forecasts which will probably reflect another decrease in the growth rate as a result of the extraordinary circumstances occurring in 1974. The new forecast may well indicate a near-future average annual growth of about 5.5 to 6.0%.

A utility's forecasts are usually intentionally conservative because it is responsible for assuring that capacity is added in time to meet customer demands. In this sense, it seems reasonable for these forecasts, which need to be made at least 10 years into the future for planning purposes, to represent a "probable high" power demand. Summary statements that explain in varying detail the methods used to forecast future power demands were reviewed for several of the utility companies located in the Electric Service Area.

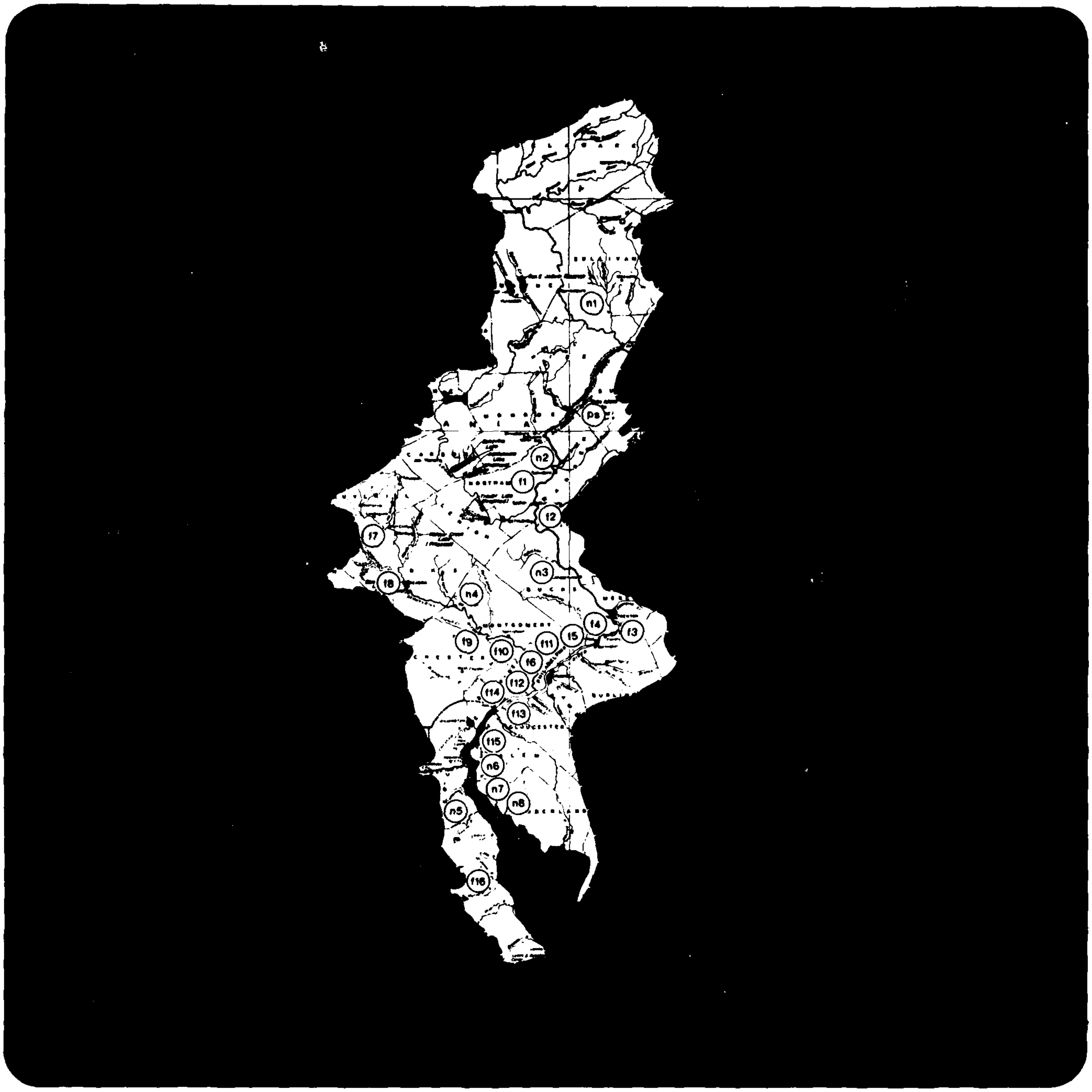
The existing methodology has evolved in each utility company to meet its individual needs. These methods were primarily developed under the comparatively stable economic framework in existence prior to the energy crisis and current recession. In studying the various factors that influence power growth rates, nearly all of the seven utilities considered in this review analyze their customer's power requirements by the following major classes of service: residential, commercial and industrial. However, the methods in use vary considerably within the Electric Service Area.

The utilities' projected additions to their existing power supply are presently being revised as a consequence of downward revisions in the future demand estimates. As of this writing, the 1974 Master Siting Plans (as modified by the utilties in early 1975) reflect the latest detailed information as to the planned sizes and locations of new generating units. The major effect of reduced demand on these Plans has been to delay the proposed operation dates as shown in them. Figures 6 and 7 summarize, as of early 1975, the planned or proposed additions and retirements of power plants identified by the utilities operating in the Delaware and Susquehanna River Basins. Each figure has maps of the respective basis showing the locations of the plants described on the tables. Planned or proposed plants are listed with an index to the map indicated in "upper case" letter and appropriate number, e.g. fossil (F), Nuclear (N), and pumped storage (PS).

PEAK DEMAND FORECASTS
PREPARED BY THE DELAWARE RIVER
BASIN ELECTRIC UTILITIES GROUP



Notes: (1) DRBEUG Master Siting Study, Dec. 1971
(2) DRBEUG Master Siting Study, May 1974



0 8 16 24 32
SCALE IN MILES

N

PROPOSED ADDITIONS AND RETIREMENTS OF POWER PLANTS IN THE DELAWARE RIVER BASIN TO 1988

V
6

LEGEND

- (f1) FOSSIL (F) SERIES 1 THRU 16
- (n1) NUCLEAR (N) SERIES 1 THRU 8
- (ps) PUMPED STORAGE

A COMPREHENSIVE STUDY OF THE

TOCKS ISLAND LAKE PROJECT & ALTERNATIVES

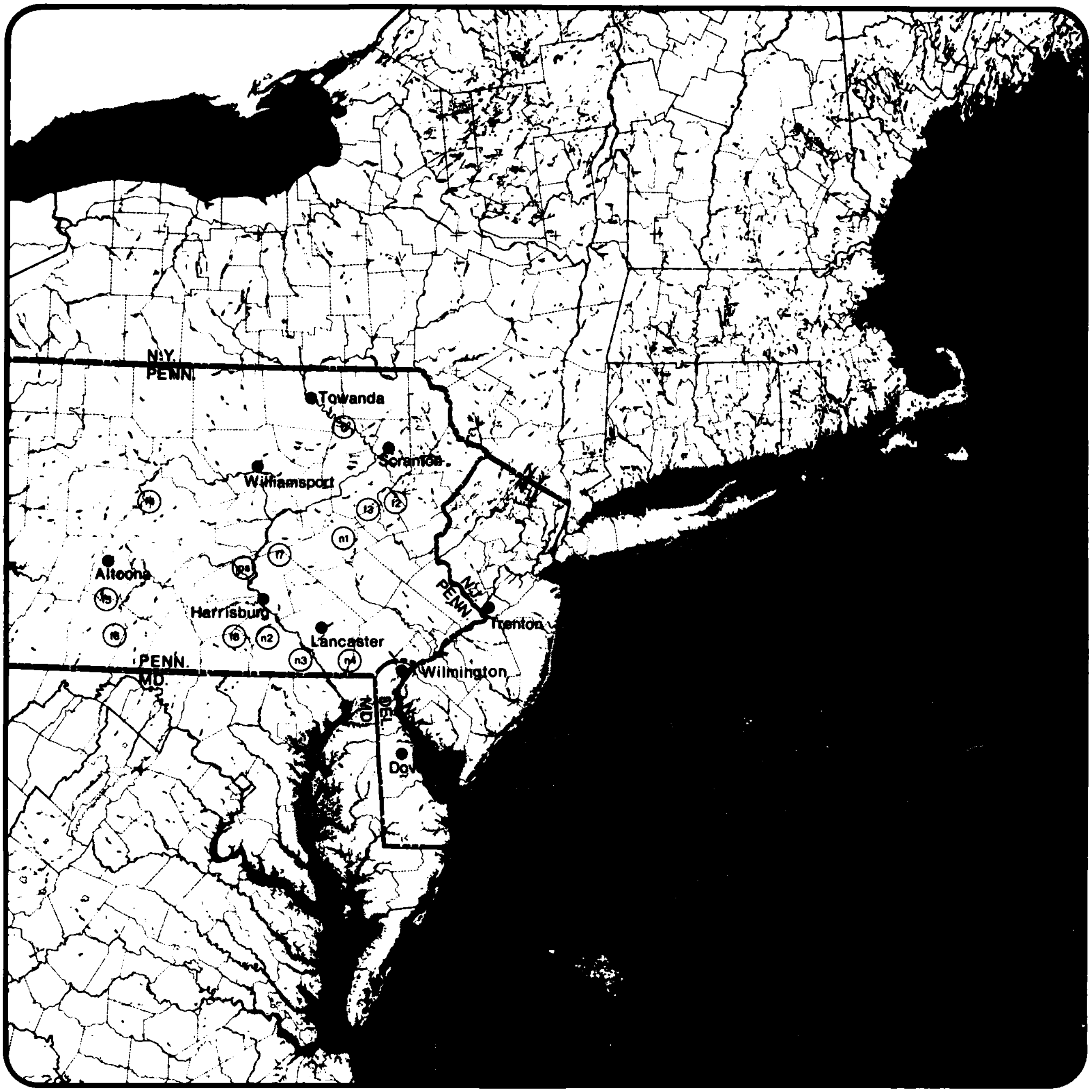
URS / MADIGAN-PRAEGER, INC. & CONKLIN AND ROSSANT

Figure V-6 (cont'd.)

PLANNED OR PROPOSED ADDITIONS AND RETIREMENTS OF POWER PLANTS IN THE DELAWARE RIVER BASIN AND COASTAL REGION TO 1988[1] (AS OF EARLY 1975)

Type	Number	Name	(Owner)	Electrical Capacity MW_e	Max. Heat Prod. MW_t
Fossil (F) Series					
	1	Martins Creek	PPL	1600	2971
	2	Gilbert	GPU	126	254
				800	1144
	3	Burlington	PSEG	40	122
	4	Richmond	PhE	-233	----
	5	Delaware	PhE	- 78	----
	6	Southwark	PhE	-369	----
	7	Berne	GPU	800	1142
	8	Eyler	GPU	- 51	----
	9	Cromby	PhE	- 12	----
	10	Barbadoes	PhE	- 6	----
	11	Schuylkill	PhE	- 70	----
	12	Eddystone	PhE	800	1274 avg
	13	Greenwich	ACE	- 12	----
	14	Chester	PhE	600	849
				-202	----
	15	Deepwater	ACE	-106	
	16	McKee Run	CDD	100	314
			Sub-total	3721	8070
Nuclear (N) Series					
	1	Delayed			
	2	Portland	GPU	1120	2226
	3	Upper Delaware River	PhE	3000	6590
	4	Limerick	PhE	2110	4627
	5	Summit	DPEL, PE	1540	2518
	6	Hope Creek	PSEG, ACE	2200	4820
	7	Salem	PSEG, others	2205	4686
	8	Delaware Bay	PSEG	2300	4891
			Sub-total	14475	30458
Pumped Storage (PS) Series					
	PS	Kittatinny Mountain	PSEG, GPU	1300	----
			Total	19496	38528

1/ Identified by utilities operating in the basin 1974



PROPOSED ADDITIONS AND RETIREMENTS OF POWER PLANTS IN THE SUSQUEHANNA RIVER BASIN TO 1988

V

7

LEGEND

- (f1) FOSSIL (F) SERIES 1 THRU 8
- (n1) NUCLEAR (N) SERIES 1 THRU 4
- (ps) PUMPED STORAGE

A COMPREHENSIVE STUDY OF THE

TOCKS ISLAND LAKE PROJECT & ALTERNATIVES

URS / MADIGAN-PRAEGER, INC. & CONKLIN AND ROSSANT

Figure V-7 (cont'd.)

PLANNED OR PROPOSED ADDITIONS AND RETIREMENTS OF POWER PLANTS IN THE SUSQUEHANNA RIVER BASIN AND COASTAL REGION TO 1988[1] (AS OF EARLY 1975)

Type	Number	Name	(Owner)	Electrical Capacity MW_e	Max. Heat Prod. MW_t
Fossil					
(F) Series					
	1	Scottsville	GPU	800	1142
	2	Hanover	LED-UGI	600	1025
	3	Hunlock	LED-UGI	-43	
	4	Clearfield County	GPU	800	1142
	5	Williamsburg	GPU	-30	
	6	Saxton	GPU	-35	
	7	Z-2	PPL	800	978
	8	Crawford	GPU	-111	
			Sub-total	2781	4287
Nuclear					
(N) Series					
	1	Susquehanna	PPL	2100	4264
	2	Three Mile Island	GPU	1672	3479
	3	Peach Bottom	PhE, others	2130	4785
		" "	"	-40	
	4	Fulton	PhE	2320	3579
			Sub-total	8182	16107
Pumped Storage					
(PS) Series					
	PS	Stony Creek	PPL	1710	-
			Total	12673	20394

1/ Identified by utilities operating in the basin

The tables are prepared to show the anticipated capacity of the plants and the heat load, if any, to the environment should the plants be operated at capacity levels. The totals shown reflect the summing of both additions and retirements for the respective basins to 1988.

V.D.5 HYDROELECTRIC AND PUMPED STORAGE POTENTIAL

V.D.5 (a) Hydroelectric Potential

In the Delaware River Basin, nearly half of the average flow comes from the relatively high country lying along the River northeast of Port Jervis, New York. Much of the available sidestream capacity of that region is already occupied with hydroelelectric and water supply developments. The remaining potential would appear to be to dam the river itself. However, Public Law 90-542 (Wild and Scenic Rivers Act) has designated this part of the Delaware as a potential addition to the national system of Wild and Scenic Rivers. Thus, it is doubtful that the upper Delaware has significant potential for further hydroelectric development.

The southern portion of the basin is sufficiently low lying and populated to present little opportunity for significant hydroelectric development. Only the Schuylkill,Lehigh, Neversink and Musconetcong Rivers rise in sufficiently high country to consider developing further. Unfortunately, the drainage basins of these tributary streams are limited in area, and the flow from them is not great even in an average year (their combined flow is only slightly greater than the Delaware above Port Jervis). Both the

Lehigh and Schuylkill Rivers are already developed for hydro to some extent, and their valleys are occupied by industry (and population) that already has stressed the available water resources. Estimates by the Federal Power Commission indicate the remaining potential consists of about 750 MWe, and would be located on 23 sites, the largest of which is 150 MWe (FPC, January 1972; FPC, June 1972).

In conclusion, the future for conventional hydro development in the DRB is limited, partly because good locations are lacking, but largely because of conflicts with existing or projected land and water use.

V.D.5 (b) Pumped Storage Potential

The availability of slack electrical generating capacity in the Delaware River Basin region during the late night and early morning hours promotes the consideration of various devices to store power. One of the feasible schemes designed to do this is a pumped storage project.

In pumped storage projects, a given amount of water is withdrawn from a river system and placed in a system of artificial lakes, at least one of which differs markedly in elevation from another. Except for makeup water to replace that lost by evaporation, seepage, or dedicated withdrawal, the water used in the system is not consumed. It is passed back and forth between the lakes, propelled by pumps to an upper reservoir and then producing electricity in falling through turbines to the lower reservoir.

Estimates by the Federal Power Commission indicate that there are about 48,000 MWe of potential pumped storage on 43 sites in the basin (FPC, June, 1972). Many of these sites are not economically feasible now and probably will not be competitive with alternative power sources in the future. Some will be developed on the basis of economic soundness and satisfaction of the region's peak power requirements.

V.E. DEVELOPMENT OF ELECTRIC POWER SCENARIOS

The methodology used in developing pertinent scenarios has been described throughout the preceding sections of Chapter V. It is important to emphasize that the intent of these analyses is to define limits which bound the various areas of uncertainty. If this is done successfully, decision makers will understand the options which are available to them, and can establish standards and regulations which will support desired long-range objectives. Figure 8 shows in summary how the scenarios are formed. The scenarios evaluated in this chapter are summarized as follows:

- Scenario A-1

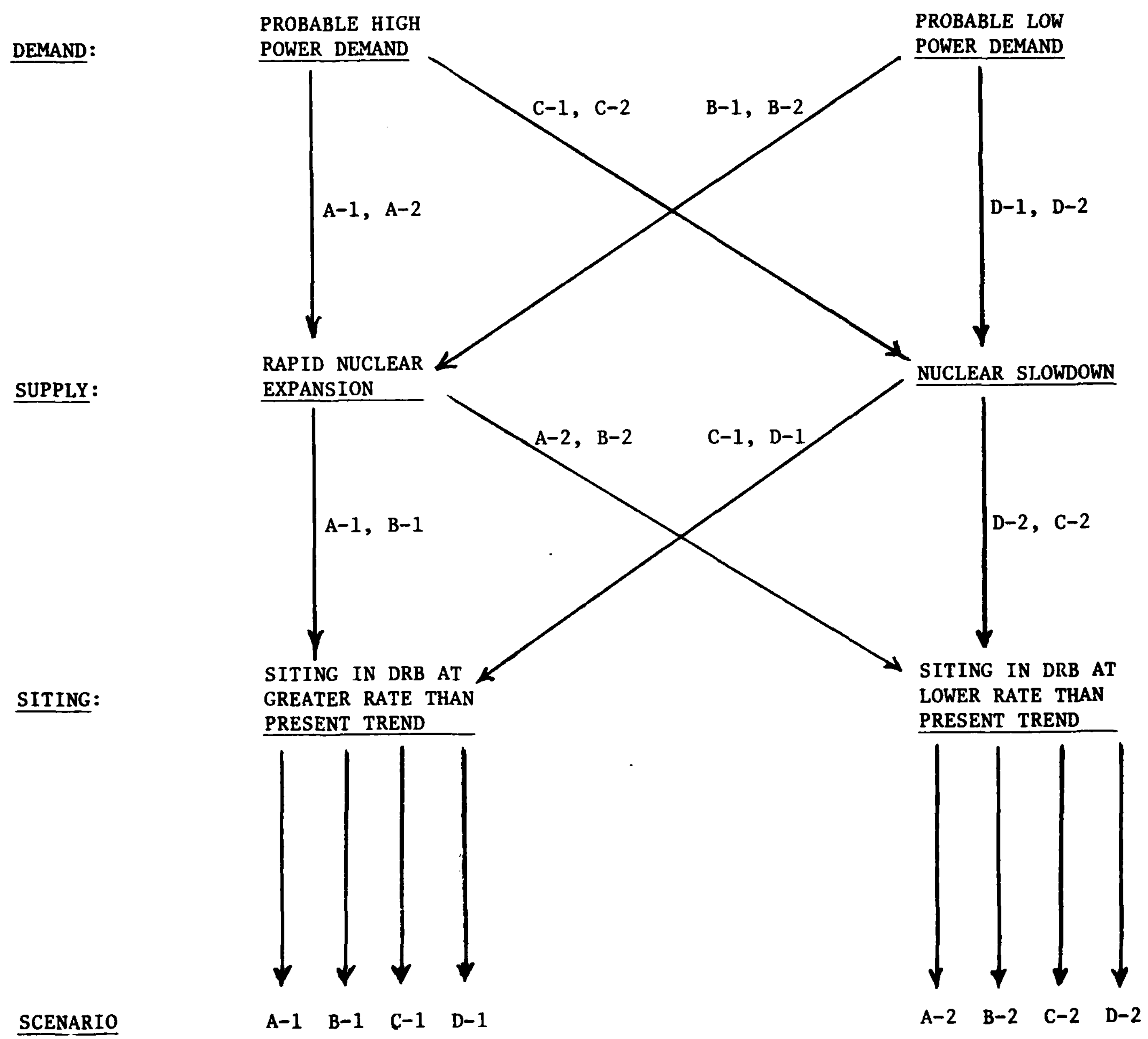
  This scenario is characterized by the following assumptions and considerations which relate to electric power demand, power supply, siting, and water consumption.

  a) Probable high power demand in the electric service area.

  b) Nuclear dominates the resource mix as a result of a strong national commitment. Some HTGR plants with dry cooling are installed during 1990 to 2000. Small amounts of additional fossil, hydro, gas turbine, pump storage and advanced energy conversion plants are utilized.

  c) Siting of new plants in the DRB continues at a higher rate than the present trend, and approximately 30% of the new thermal plants installed in the electric service area (ESA) are located in the DRB. The remaining plants are located as follows: SRB - 30%, Coast - 20%, and other - 20%.

FORMATION OF SCENARIOS



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- Scenario A-2

  Same as A-1, except that future siting in the DRB occurs at a lower rate than the present trend, and 15% of the new thermal plants installed in the ESA by 2000 are located in the DRB. The remaining plants are located as follows: SRB - 15%, Coast - 50%, and Other - 20%.

- Scenario B-1

  This scenario is characterized by:

  a) Probable low power demand in electric service area.

  b) Nuclear dominates the resource mix as a result of a strong national commitment. Some HTGR plants with dry cooling are installed during 1990 to 2000. Small amounts of additional fossil, hydro, gas turbine, pumped storage and advanced energy conversion plants are utilized.

  c) Siting of new plants in the DRB continues at a higher rate than the present trend, and approximately 30% of the new thermal plants installed in the electric service area (ESA) are located in the DRB. The remaining plants are located as follows: SRB - 30%, Coast - 20%, and Other - 20%.

- Scenario B-2

  Same as B-1, except that future siting in the DRB occurs at a lower rate than the present trend, and 15% of the new thermal plants installed in the ESA by 2000 are located in the DRB. The remaining plants are located as follows: SRB - 15%, Coast - 50%, and Other - 20%.

- Scenario C-1

This scenario is characterized as follows:

a) Probable high power demand in the electric service area.

b) Nuclear slowdown is in effect (intervenors, political leaders, and public leaders succeed in preventing expansion of nuclear power at the levels presently planned by government and industry). Accelerated implementation of coal gasification for fossil plants, MHD, fuel cells, solar, and other technologies takes place.

c) Siting of new plants in the DRB continues at a higher rate than the present trend, and approximately 30% of the new thermal plants installed in the electric service area (ESA) are located in the DRB. The remaining plants are located as follows: SRB - 30%, Coast - 20%, and Other - 20%.

- Scenario C-2

Same as C-1, except that future siting in the DRB occurs at a lower rate than the present trend, and 15% of the new thermal plants installed in the ESA by 2000 are located in the DRB. The remaining plants are located as follows: SRB - 15%, Coast - 50%, and Other - 20%.

- Scenario D-1

a) Probable low power demand in electric service area is assumed.

b) Nuclear slowdown in effect (intervenors, political leaders, and public leaders succeed in preventing expansion of nuclear

power at the levels presently planned by government and industry). Accelerated implementation of coal gasification for fossil plants, MHD, fuel cells, solar, and other advanced technologies occurs.

c) Siting of new plants in the DRB continues at a higher rate than the present trend, and approximately 30% of the new thermal plants installed in the electric service area (ESA) are located in the DRB. The remaining plants are located as follows: SRB - 30%, Coast - 20%, and Other - 20%.

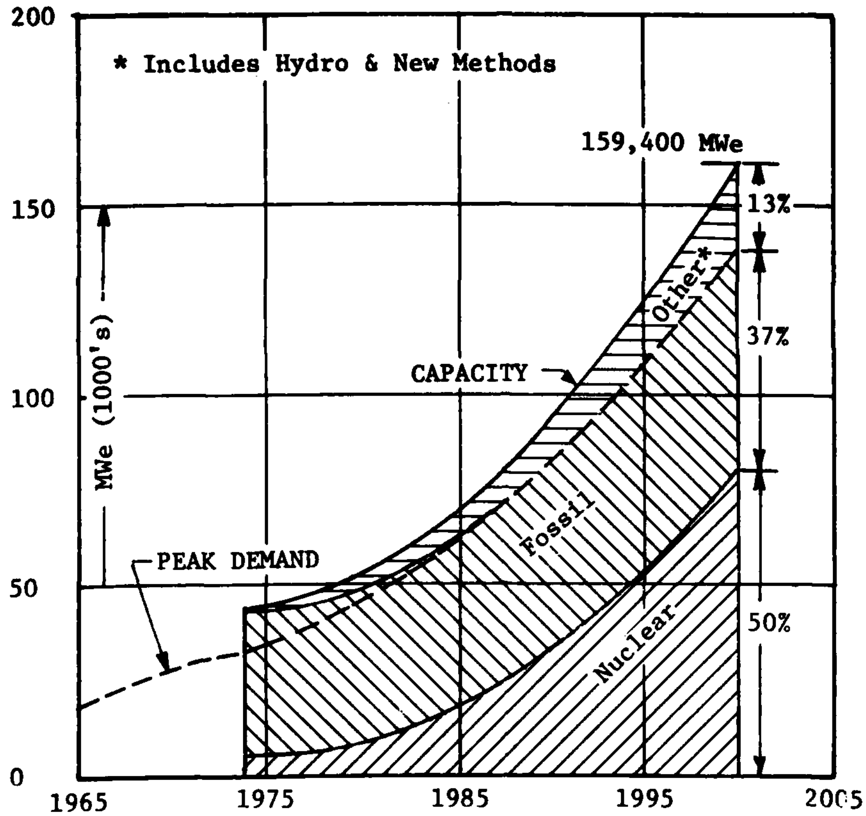
- Scenario D-2

  Same as D-1, except that future siting in the DRB occurs at a lower rate than the present trend, and 15% of the new thermal plants installed in the ESA by 2000 are located in the DRB. The remaining plants are located as follows: SRB - 15%, Coast - 50%, and other - 20%.

In addition to the eight scenarios defined above, a "probable" or "subjective" scenario has been developed by selecting intermediate values between the extremes of the power demand, power supply, and plant siting variables. At best, this is a subjective undertaking and should be interpreted as such. This represents only one of a number of "probable" scenarios which could be developed.

The results of the scenario evaluations are presented in Tables 10 through 18. The assumptions and considerations which are the basis for each scenario are given in the text following these tables.

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable high (nominal 6% average annual growth)

SUPPLY - Rapid Nuclear Expansion

SITING - Probable high in DRB (DRB - 30% of ESA capacity; SRB-30%; Coastal - 20%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD,ETC	
DRB	14.0	4.4	4.4	14.0	3.3	1.0	3.0	3.7	47.8
SRB	14.0	4.4	4.4	14.0	3.3	2.2	1.8	3.7	47.8
COAST	9.9	3.6	3.5	9.9	2.3	-	-	2.7	31.9
OTHER	9.9	3.5	3.6	9.9	2.3	-	-	2.7	31.9
TOTAL	47.8	15.9	15.9*	47.8	11.2	3.2	4.8	12.8	159.4

* Dry Cooling

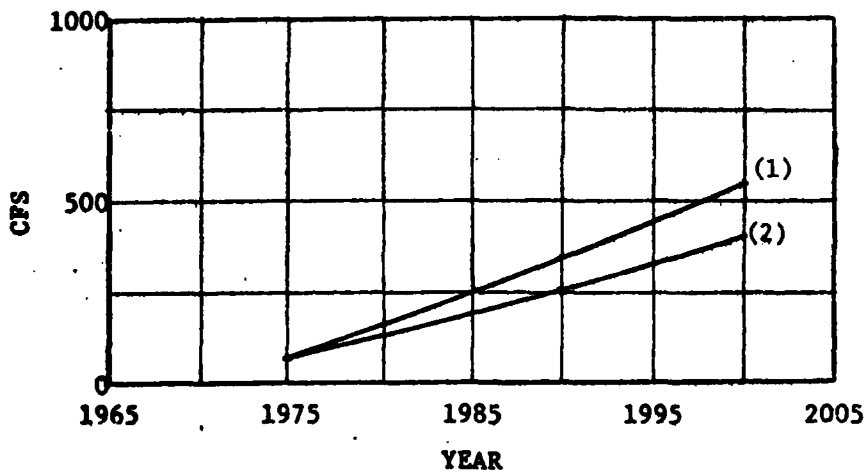
Table 5-10 SCENARIO A-1

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

THERMAL CAPACITY	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	10.5	3.5	14.0
NUCLEAR (LMFBR)	3.3	1.1	4.4
FOSSIL STEAM	10.5	3.5	14.0
TOTAL	24.3	8.1	32.4

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Numbers of Sites Required (Approx)

	NUCLEAR (3)	FOSSIL (4)
DRB	8	12
SRB	8	12
Coastal	7	8
Other	7	8

(3) Assumes 2000 to 4000 MWe per site
(4) Assumes 1000 to 2000 MWe per site

Note: Cooling Mixture Indicated by:

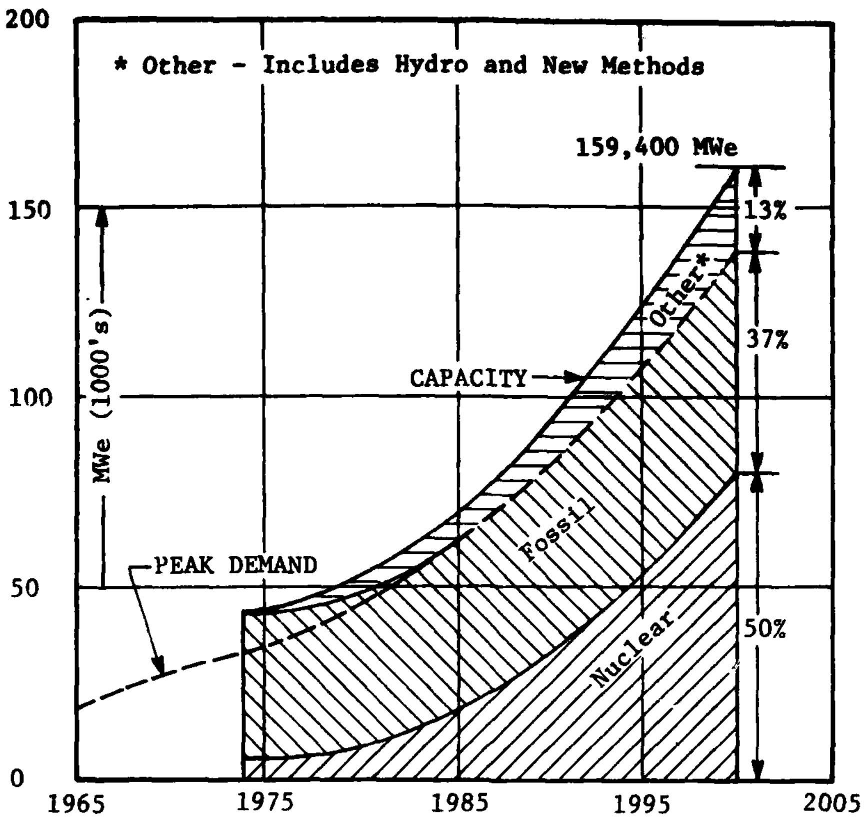
Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

SCENARIO A-1

Table 5-10 (continued)

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable high (nominal 6% average annual growth)

SUPPLY - Rapid Nuclear Expansion

SITING - Probable low siting in DRB (15% of total capacity in DRB; SRB - 15%, Coast - 50%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD, ETC	
DRB	6.6	2.1	2.1	6.6	1.1	1.0	3.0	1.4	23.9
SRB	6.6	2.1	2.1	6.6	1.1	2.2	1.8	1.4	23.9
COAST	24.8	8.3	8.3	24.8	6.5	-	-	7.0	79.7
OTHER	9.8	3.4	3.4	9.8	2.5	-	-	3.0	31.9
TOTAL	47.8	15.9	15.9 *	47.8	11.2	3.2	4.8	12.8	159.4

*Dry Cooling

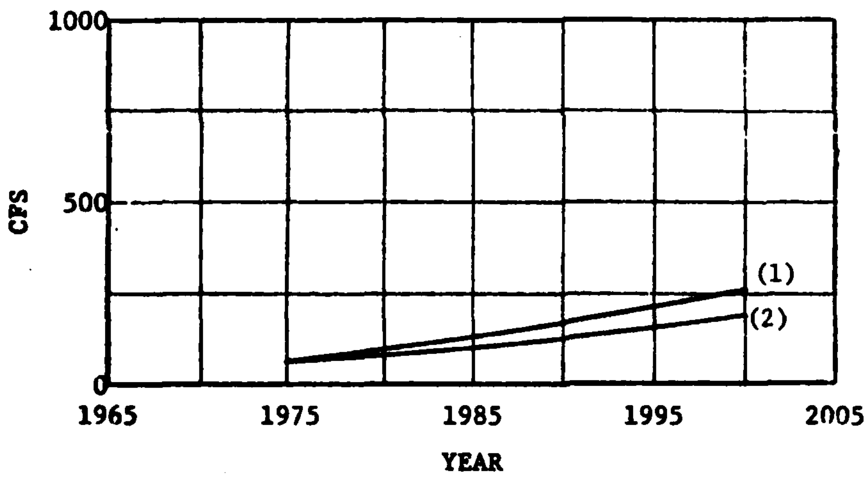
Table 5-11 SCENARIO A-2

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	5.0	1.6	6.6
NUCLEAR (LMFBR)	1.5	0.6	2.1
FOSSIL STEAM	5.0	1.6	6.6
TOTAL	11.5	3.8	15.3

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Numbers of Sites Required (Approx)

	NUCLEAR (3)	FOSSIL (4)
DRB	5	5
SRB	6	5
Coastal	14	20
Other	6	8

(3) Assumes 2000 to 4000 MWe per site

(4) Assumes 1000 to 2000 MWe per site

Note: Cooling Mixture Indicated by:

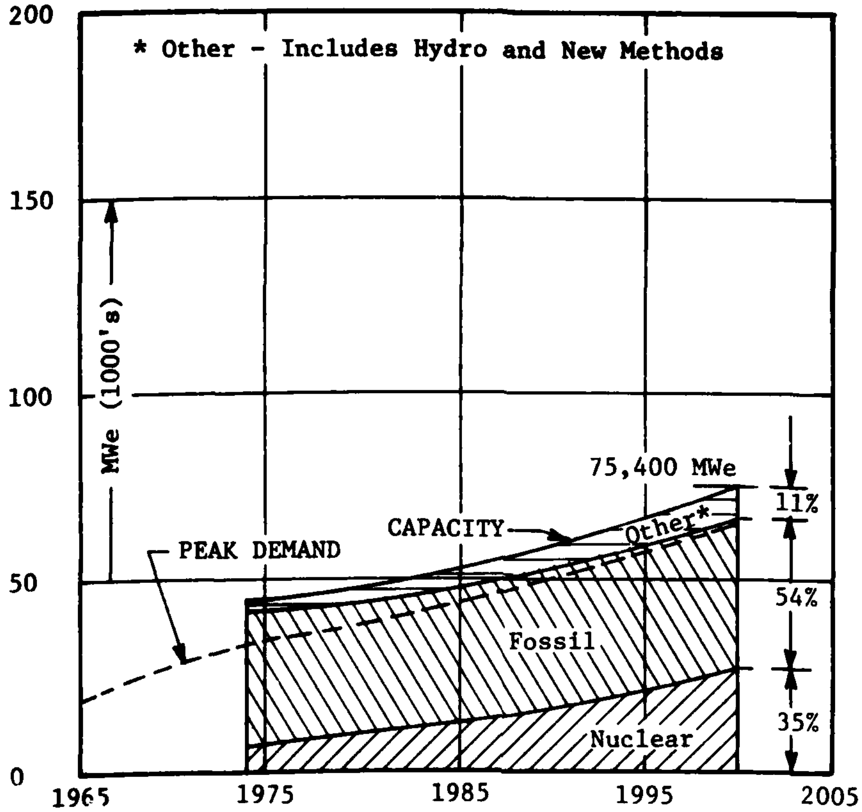
Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

SCENARIO A-2

Table 5-11
(continued)

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable low (nominal 3% average annual growth)

SUPPLY - Rapid nuclear expansion

SITING - Probable high siting in DRB (30% of total capacity in DRB; SRB - 30%; Coast - 20%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD, ETC	
DRB	4.2	1.7	2.1	8.8	2.1	0.8	1.5	1.4	22.6
SRB	4.2	1.7	2.1	8.8	2.1	0.7	1.6	1.4	22.6
COAST	3.3	1.1	0.7	7.1	2.4	-	-	0.5	15.1
OTHER	3.4	1.1	0.7	7.0	2.4	-	-	0.5	15.1
TOTAL	15.1	5.6	5.6 *	31.7	9.0	1.5	3.1	3.8	75.4

*Dry Cooling

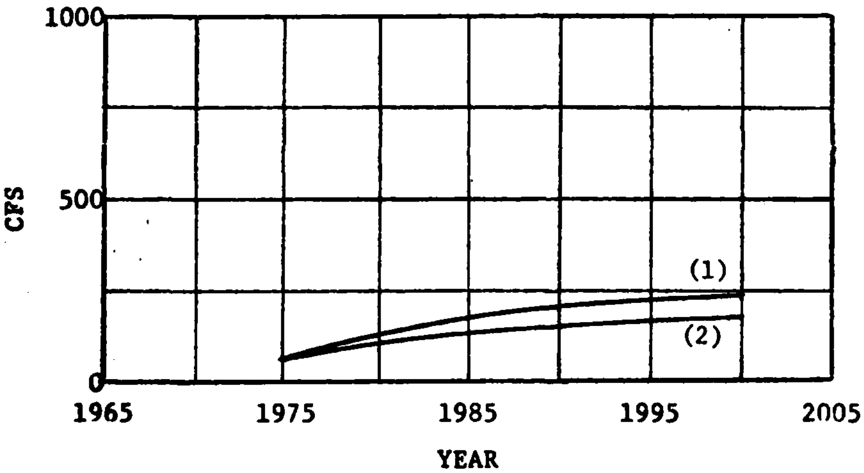
Table 5-12 **SCENARIO B-1**

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	3.1	1.1	4.2
NUCLEAR (LMFBR)	1.3	0.4	1.7
FOSSIL STEAM	6.6	2.2	8.8
TOTAL	11.0	3.7	14.7

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Numbers of Sites Required (Approx)

	NUCLEAR [3]	FOSSIL [4]
DRB	4	7
SRB	4	7
Coastal	2	6
Other	2	6

(3) Assumes 2000 to 4000 MWe per site

(4) Assumes 1000 to 2000 MWe per site

Note: Cooling Mixture Indicated by:

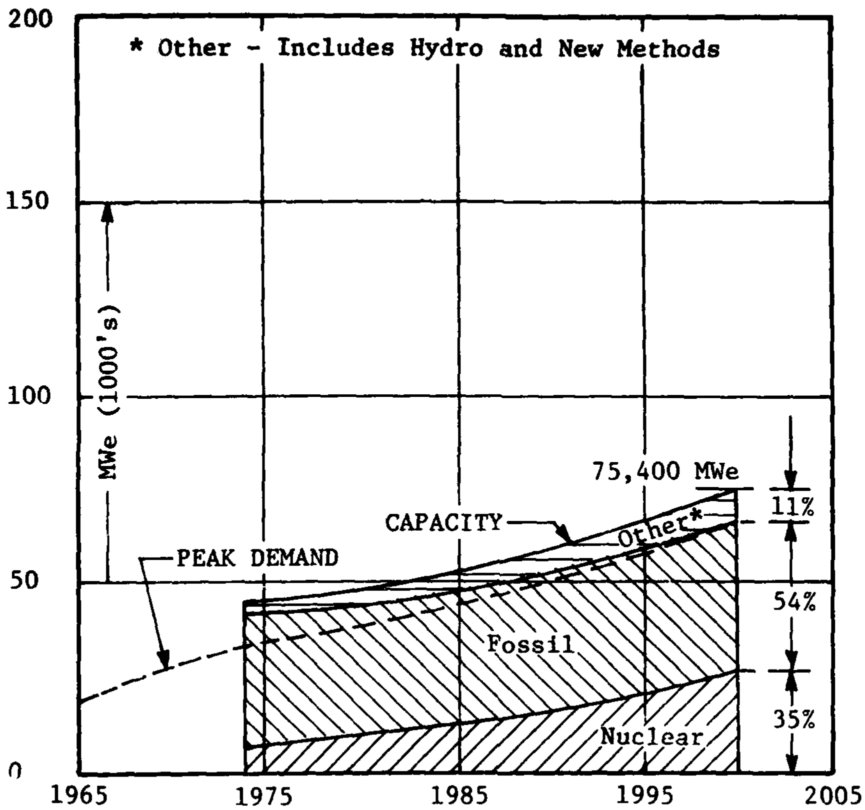
Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

SCENARIO B-1

Table 5-12 (continued)

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable low (nominal 3% average annual growth)

SUPPLY - Rapid nuclear expansion

SITING - Probable low siting in DRB (15% of total capacity in DRB; SRB - 15%; Coast - 50%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD, ETC	
DRB	2.0	0.6	0.6	4.5	1.0	0.7	1.5	0.4	11.3
SRB	2.0	0.6	0.6	4.4	0.9	0.8	1.6	0.4	11.3
COAST	8.0	3.1	3.1	16.2	5.1	-	-	2.2	37.7
OTHER	3.1	1.3	1.3	6.6	2.0	-	-	0.8	15.1
TOTAL	15.1	5.6	5.6 *	31.7	9.0	1.5	3.1	3.8	75.4

*Dry Cooling

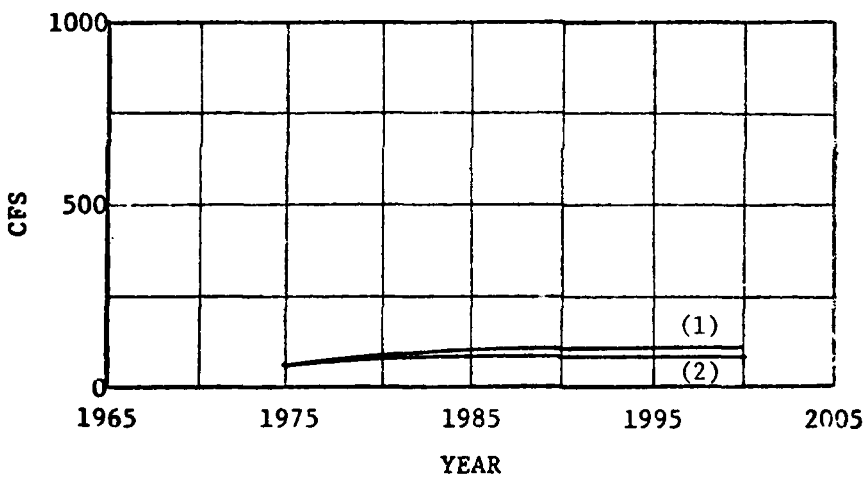
Table 5-13 **SCENARIO B-2**

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	1.5	0.5	2.0
NUCLEAR (LMFBR)	0.6	—	0.6
FOSSIL STEAM	3.4	1.1	4.5
TOTAL	5.5	1.6	7.1

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Numbers of Sites Required (Approx)

	NUCLEAR[3]	FOSSIL[4]
DRB	2	4
SRB	2	4
Coastal	6	13
Other	4	6

(3) Assumes 2000 to 4000 MWe per site
(4) Assumes 1000 to 2000 MWe per site

Note: Cooling Mixture Indicated by:

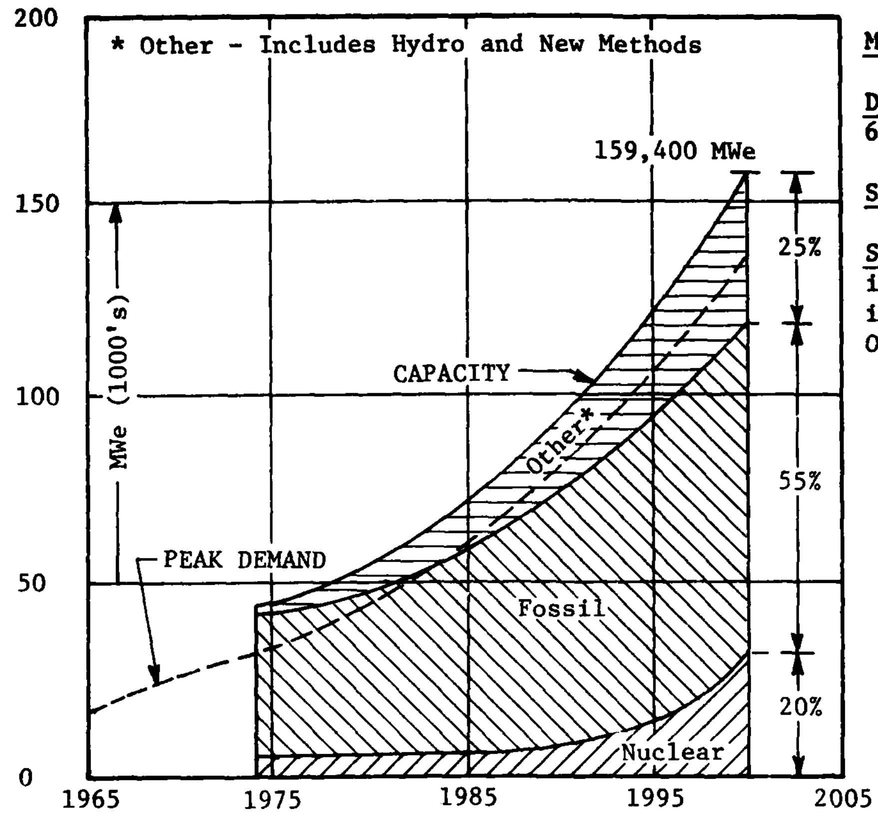
Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

SCENARIO B-2

Table 5-13
(continued)

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable high (nominal 6% average annual growth)

SUPPLY - Nuclear slowdown

SITING - Probable high siting in DRB (30% of total capacity in DRB; SRB - 30%; Coast - 20%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD,ETC	
DRB	4.6	2.2	2.0	23.0	3.0	1.0	5.0	7.0	47.8
SRB	4.6	2.2	2.1	20.4	2.6	3.8	6.1	6.0	47.8
COAST	3.4	1.8	2.0	16.4	2.8	-	-	5.5	31.9
OTHER	3.3	1.8	1.9	16.7	2.7	-	-	5.5	31.9
TOTAL	15.9	8.0	8.0 *	76.5	11.1	4.8	11.1	24.0	159.4

*Dry Cooling

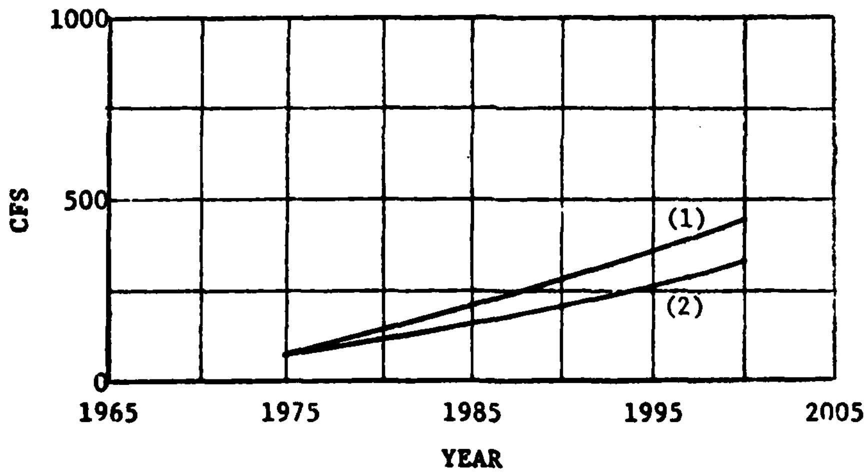
Table 5-14 **SCENARIO C-1**

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	3.4	1.2	4.6
NUCLEAR (LMFBR)	1.6	0.6	2.2
FOSSIL STEAM	17.3	5.7	23.0
TOTAL	22.3	7.5	29.8

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Note: Cooling Mixture Indicated by:

Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

Numbers of Sites Required (Approx)

	NUCLEAR (3)	FOSSIL (4)
DRB	4	18
SRB	4	16
Coastal	4	13
Other	4	13

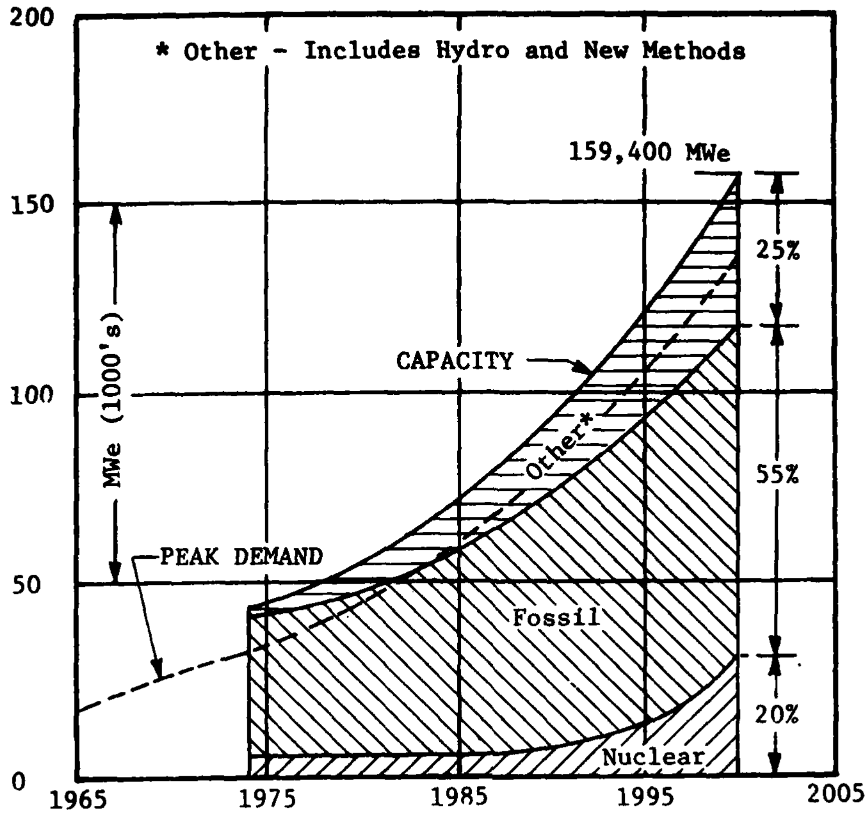
(3) Assumes 2000 to 4000 MWe per site

(4) Assumes 1000 to 2000 MWe per site

SCENARIO C-1

Table 5-14 (continued)

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable high (nominal 6% average annual growth)

SUPPLY - Nuclear slowdown

SITING - Probable low siting in the DRB (15% of total capacity in DRB; SRB - 15%; Coast - 50%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD,ETC	
DRB	1.7	1.0	1.0	9.0	1.5	1.0	5.0	3.7	23.9
SRB	1.1	0.6	0.6	8.0	1.2	3.8	6.1	2.5	23.9
COAST	9.2	4.6	4.8	42.2	5.9	-	-	13.0	79.7
OTHER	3.9	1.8	1.6	17.3	2.5	-	-	4.8	31.9
TOTAL	15.9	8.0	8.0 *	76.5	11.1	4.8	11.1	24.0	159.4

*Dry Cooling

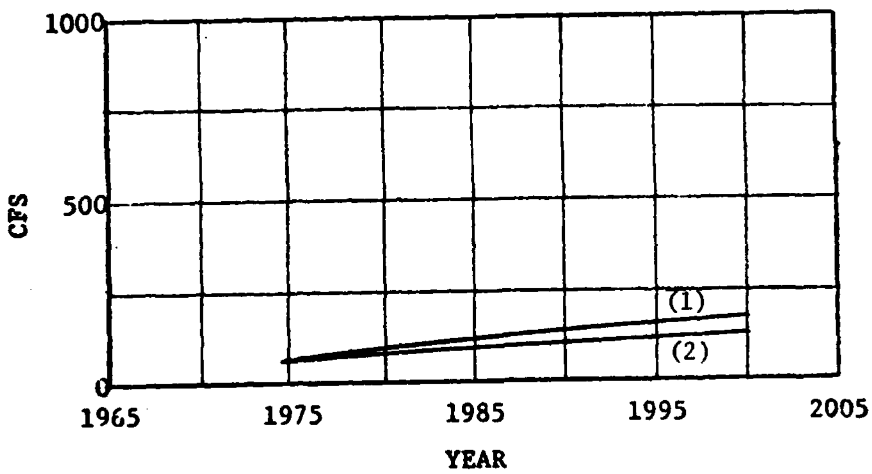
Table 5-15 SCENARIO C-2

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	1.3	0.4	1.7
NUCLEAR (LMFBR)	1.0	-	1.0
FOSSIL STEAM	6.7	2.3	9.0
TOTAL	9.0	2.7	11.7

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Numbers of Sites Required (Approx)

	NUCLEAR (3)	FOSSIL (4)
DRB	2	7
SRB	2	7
Coastal	8	28
Other	4	13

(3) Assumes 2000 to 4000 MWe per site
(4) Assumes 1000 to 2000 MWe per site

Note: Cooling Mixture Indicated by:

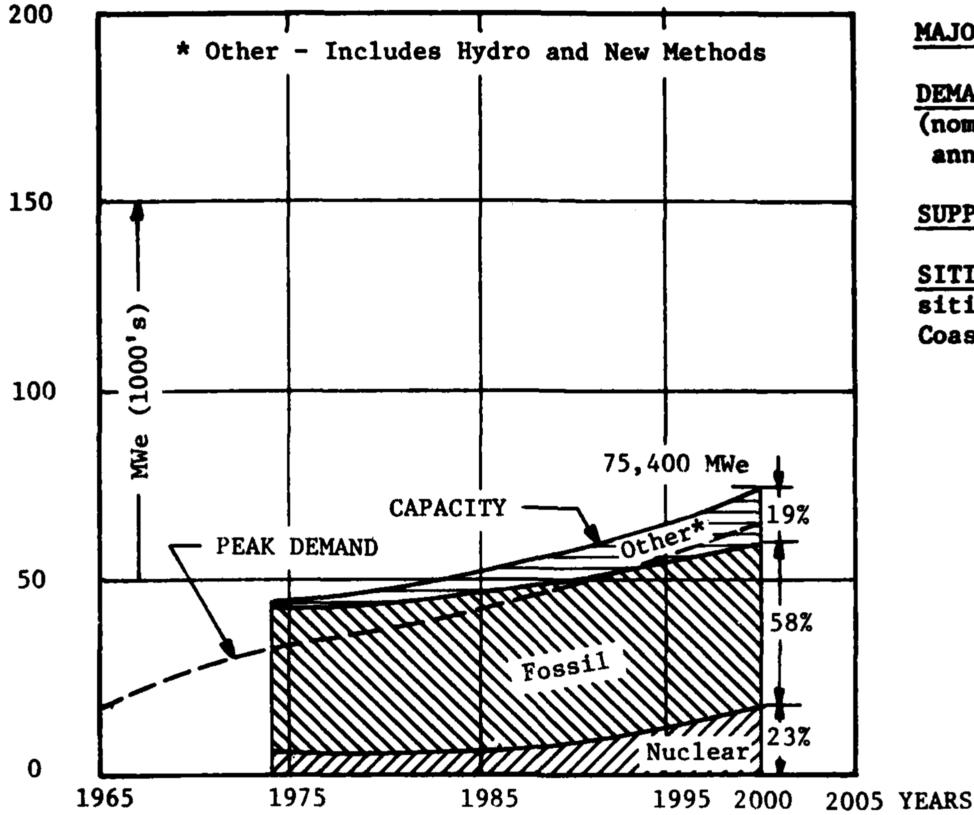
Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

SCENARIO C-2

Table 5-15 (continued)

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable low (nominal 3% average annual growth)

SUPPLY - Nuclear slowdown

SITING - Probable high siting in DRB; SRB - 30%; Coast - 20%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD,ETC	
DRB	3.2	0.7	0.8	10.0	2.7	0.8	2.2	2.2	22.6
SRB	3.0	0.6	0.6	10.0	2.6	1.5	2.3	2.0	22.6
COAST	2.6	0.8	0.8	7.3	1.9	-	-	1.7	15.1
OTHER	2.5	0.9	0.8	7.4	1.8	-	-	1.7	15.1
TOTAL	11.3	3.0	3.0*	34.7	9.0	2.3	4.5	7.6	75.4

*Dry Cooling

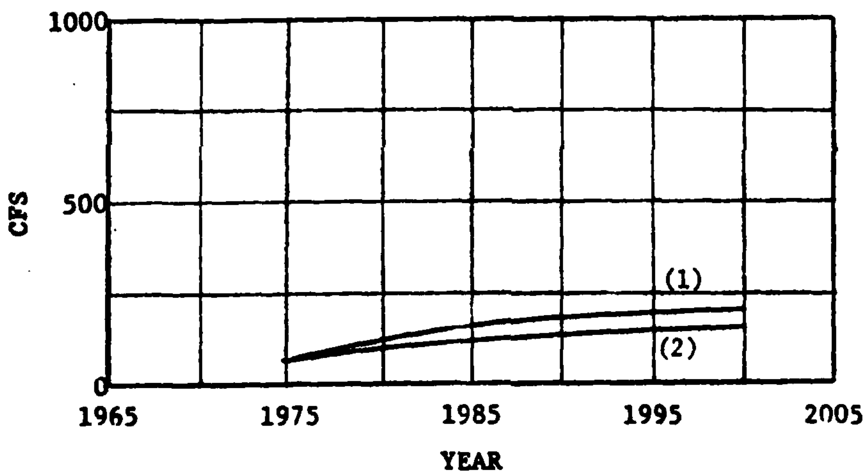
Table 5-16 SCENARIO D-1

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	2.4	0.8	3.2
NUCLEAR (LMFBR)	0.7	-	0.7
FOSSIL STEAM	7.5	2.5	10.0
TOTAL	10.6	3.3	13.9

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Numbers of Sites Required (Approx)

	NUCLEAR	FOSSIL
DRB	2	9
SRB	2	9
Coastal	2	7
Other	2	7

(3) Assumes 2000 to 4000 MWe per site
(4) Assumes 1000 to 2000 MWe per site

Note: Cooling Mixture Indicated by:

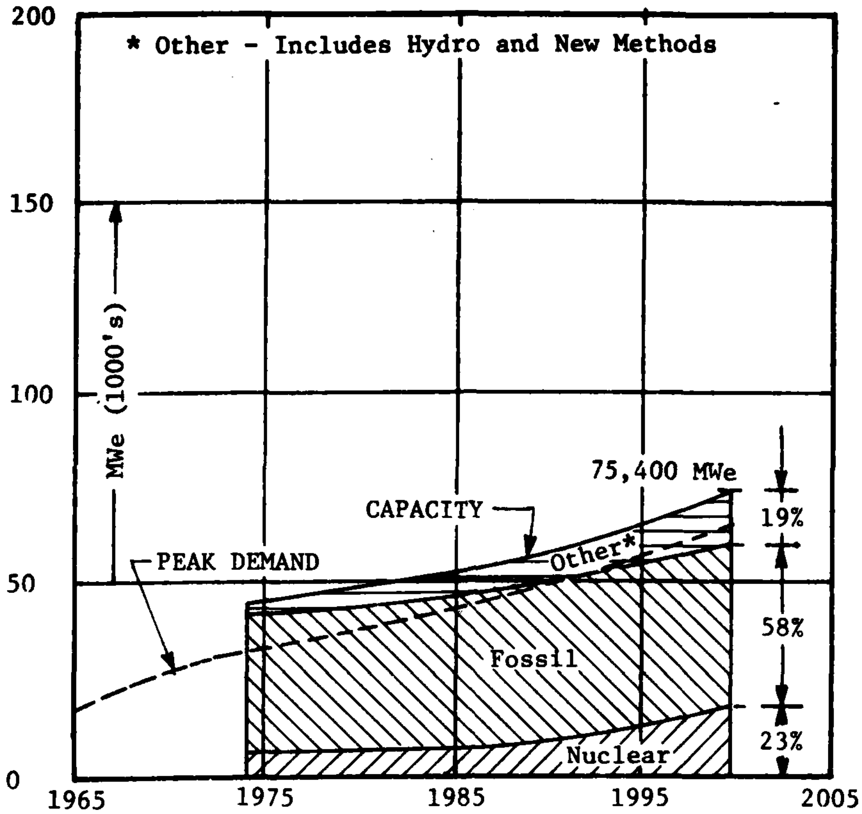
Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

SCENARIO D-1

Table 5-16 (continued)

CAPACITY & DEMAND vs TIME



MAJOR ASSUMPTIONS

DEMAND - Probable low (nominal 3% average annual growth)

SUPPLY - Nuclear slowdown

SITING - Probable low siting in DRB (15% of total capacity in DRB; SRB - 15%; Coast - 50%; Other - 20%)

YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD, ETC	
DRB	2.0	-	-	4.2	1.1	0.8	2.2	1.0	11.3
SRB	1.7	-	-	4.0	0.9	1.5	2.3	0.9	11.3
COAST	5.5	2.0	2.0	19.0	5.1	-	-	4.1	37.7
OTHER	2.1	1.0	1.0	7.5	1.9	-	-	1.6	15.1
TOTAL	11.3	3.0	3.0 *	34.7	9.0	2.3	4.5	7.6	75.4

*Dry Cooling

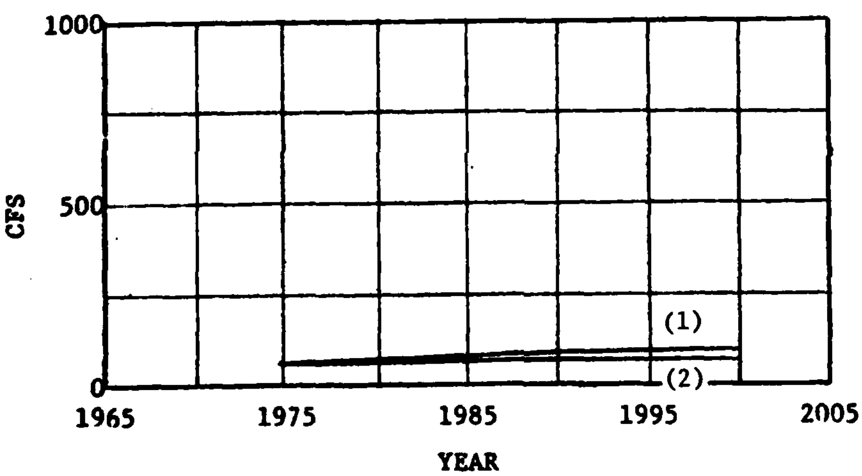
Table 5-17 SCENARIO D-2

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	1.5	0.5	2.0
NUCLEAR (LMFBR)	-	-	-
FOSSIL STEAM	3.1	1.1	4.2
TOTAL	4.6	1.6	6.2

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Numbers of Sites Required (Approx)

	NUCLEAR (3)	FOSSIL (4)
DRB	1	4
SRB	1	4
Coastal	3	18
Other	3	6

(3) Assumes 2000 to 4000 MWe per site

(4) Assumes 1000 to 2000 MWe per site

Note: Cooling Mixture Indicated by:

Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

SCENARIO D-2

Table 5-17
(continued)

BASIS FOR PROBABLE (SUBJECTIVE) SCENARIO

I. Electric Power Demand Growth in the electric service area is assumed to decrease gradually in comparison to previous growth rates as follows:

- 5.5% during 1975 - 1982
- 4.5% during 1983 - 1990
- 3.5% during 1991 - 2000

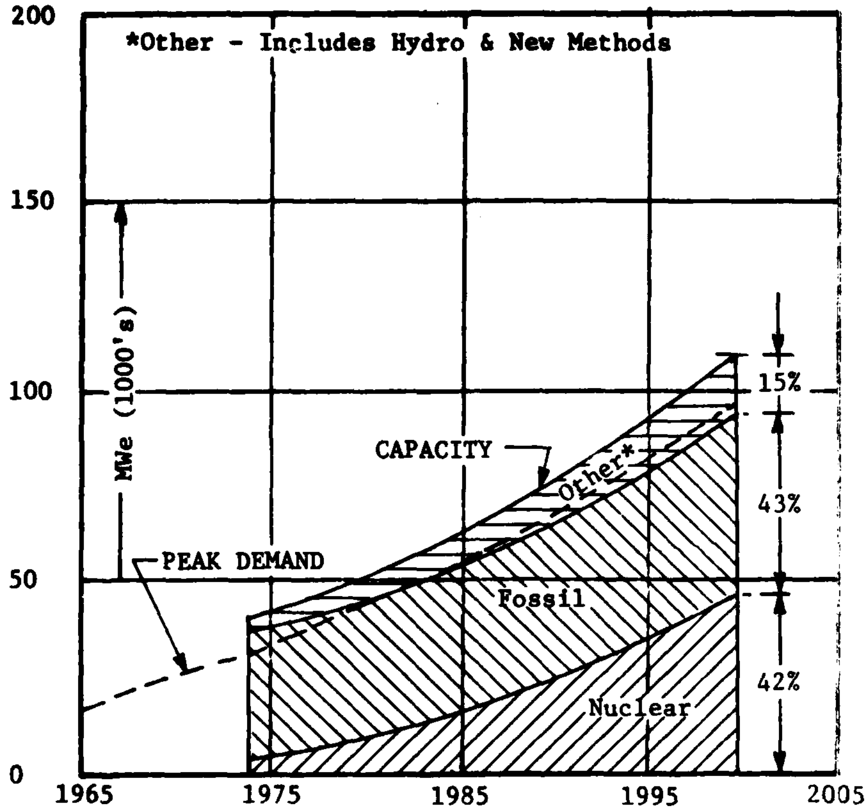
The year 2000 power demand is about 95,000 MW using these growth rates, and the capacity needed is about 110,000 MW for 15% reserve margin.

II. Electric Power Supply in 2000 assumes substantial installations of nuclear power, although not on the scale of Scenario A. Nuclear capacity is added at an average rate of about 1800 MWe per year during 1975 - 2000. Coal-fired steam plants accounts for much of the remaining capacity, but not on the scale of Scenario C. Hydro and pumped storage are developed almost to the levels of Scenario C.

III. Power Plant Siting in the DRB is assumed to continue at slightly less than the present trend (about 23%). In 2000, the DRB contains 20% of the capacity serving the-ESA.

Summary - Based on the above, this scenario is shown in the following:

CAPACITY & DEMAND vs TIME



YEAR 2000 INSTALLED CAPACITY IN ESA BY SUBREGIONS (1000 MWe)

	NUCLEAR			FOSSIL		HYDRO		NEW METHODS	TOTAL
SUB-REGION	.LWR .HTGR	LMFBR	GAS TURBINE HTGR	STEAM	GAS TURBINE	CONV	PUMPED STORAGE	FUELCELL SOLAR MHD, ETC	
DRB	5.5	1.0	1.0	7.5	1.0	1.0	3.5	1.5	22.0
SRB	5.5	1.0	1.0	7.5	1.0	3.5	1.0	1.5	22.0
COAST	14.3	4.0	2.0	20.0	0.7	-	-	3.0	44.0
OTHER	7.2	2.0	1.5	9.0	0.7	-	-	1.6	22.0
TOTAL	32.5	8.0	5.5*	44.0	3.4	4.5	4.5	7.6	110.0

*Dry Cooling

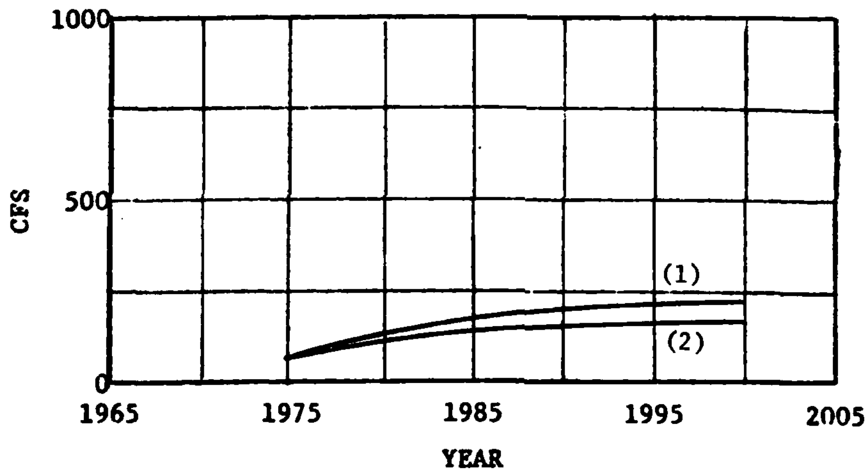
Table 5-18 PROBABLE SCENARIO

DRB INSTALLED THERMAL CAPACITY IN 2000 (1000 MWe)

	COOLING TOWERS*	ONCE THROUGH*	TOTAL
NUCLEAR (LWR, HTGR)	4.1	1.4	5.5
NUCLEAR (LMFBR)	1.0	–	1.0
FOSSIL STEAM	5.6	1.9	7.5
TOTAL	10.7	3.3	14.0

*Assumes 75% C.T. and 25% O.T.

PEAK EVAPORATION RATE vs TIME



Note: Cooling Mixture Indicated by:

Curve (1): 75% wet cooling towers
25% once-through cooling

Curve (2): 75% wet cooling towers
25% once-through cooling

Numbers of Sites Required (Approx)

	NUCLEAR[3]	FOSSIL[4]
DRB	4	7
SRB	4	7
Coastal	9	12
Other	5	7

(3) Assumes 2000 to 4000 MWe per site
(4) Assumes 1000 to 2000 MWe per site

PROBABLE SCENARIO

Table 5-18
(continued)

BASIS FOR SCENARIOS A-1 and A-2

Probable High Power Demand - Nuclear Dominant Resource Mix

I. Electric Power Demand in the electric service area increases at an annual growth rate of 6.0% during 1975 - 1990 and 5.5% during 1991 - 2000.

Assumptions and Considerations (1975 - 2000)

- General economic growth is similar to that experienced during 1950 - 1975, although somewhat reduced.
- Population growth is 1.3% per year (avg)
- Per capita income growth is 3.0% per year (avg)
- Electric power price increases are implemented on a low-key basis and have only a slight dampening effect on demand.
- Conservation measures; such as, better insulation in new buildings, increasing electric appliance efficiencies, reducing lighting requirements, constructing "low-energy" buildings; are implemented on a low-key basis. Rationing of electricity does not occur.
- Solar space heating and cooling and water heating installations in new buildings have a minor effect in reducing demand.
- The increasing scarcity of fossil fuels results in some substitution of electricity for such fuels. Development takes place in transportation electrification (autos, trucks, etc.) and converting end-use space heating, water heating, cooking, industrial processes, etc., to electricity. The "electric economy" offsets some of the gains in demand reduction achieved as a result of price increases, conservation measures, and use of solar energy.

II. Electric Power Supply in the electric service area is provided by accelerated installations of nuclear power, with lesser

dependence on coal gasification, oil and natural gas, and advanced energy conversion technologies.

Assumptions and Considerations (1975 - 2000)

- A strong national commitment to nuclear power evolves because:
  - *Questions concerning nuclear* safety, radioactive waste disposal, and environmental effects are resolved to the satisfaction of most public and political leaders.
  - A national energy policy limits the amounts of fossil fuels which can be used in producing electricity.
  - Coal gasification which could provide clean boiler fuel is limited because coal mining regulations continue to be stringent.
- The Liquid Metal Fast Breeder Reactor (LMFBR) development is successful, and commercial installations begin in the late 1980's. Thus, uranium fuel reserves are extended indefinitely.
- The Gas Turbine High Temperature Gas-Cooled Reactor (HTGR) development is successful, and commercial installations begin in the early 1990's. Dry cooling towers are used.
- Research and development of non-nuclear advanced energy conversion continues, but not with the strong commitment given to nuclear power:
  - Some installations of fuel cells, MHD generators, and flywheel generators are made during 1975 - 2000.
  - Some installations of solar thermal plants and compressed air storage plants are made during 1990 - 2000.
  - Fusion plants are not commercial by 2000.
- Based on the above assumptions, the resource mix in the electric service area by 2000 is projected to be:
  - Nuclear (50% of total installed capacity in 2000)
    - LWR and HTGR Steam (30%)
    - LMFBR and Gas Turbine HTGR (20%)
  - Fossil (37%)
    - Steam (30%)
    - Gas Turbine and Diesel (7%)

- Hydroelectric (5%)
  - Conventional (2%)
  - Pumped Storage (3%)

- Advanced Energy Conversion (8%)
  Solar thermal, fuel cells, MHD, flywheels, compressed air storage, and others

III. Power Plant Siting in the electric service area

Assumptions and Considerations (1975 - 2000)

- Dry cooling is not used with the thermal plants because of prohibitive power penalties and additional costs. Dry cooling is used with the Gas Turbine HTGR.

- The four major siting subregions within the electric service area are defined as:

  - The Delaware River Basin (less the estuary portion of the Delaware Bay approximately south of Salem, N.J.); i.e. freshwater region of DRB

  - The Susquehanna River Basin - freshwater region

  - The Atlantic Coast, including offshore waters, and the Delaware Bay estuary region

  - Other portions of ESA

By 2000, the total capacity is assumed to be allocated for Scenarios 1 and 2 as follows:

	Scenario 1	Scenario 2
DRB	30%	15%
SRB	30%	15%
Coastal	20%	50%
Other	20%	20%

The siting allocation in column 1 is representative of an increased siting rate in the DRB (and SRB) in comparison to the present trend (about 23%). Column 2 represents a decreased siting rate in the DRB (and SRB), with the coastal region being heavily called upon. This basically assumes that many nuclear plants would be sited offshore, and fossil plants would be sited at coastal and estuary locations.

- The EPA's power plant effluent control regulations are stringently enforced, and 75% of the above thermal plants in the DRB subregion use evaporative cooling (wet towers, spray canals, wet/dry towers) and 25% use once-through cooling. Similarly, the SRB has a 75/25 split. The coastal subregion is all once-through.

- Power plant water evaporation (1975 - 2000)

Evaporation is determined for peak periods, as opposed to annual averages or annual total consumption, because peak evaporation is the result of high power demand during the summer and occurs in coincidence with low river flows.

- At time of peak power demand, nuclear and fossil base load plants are assumed to be operating at 90% capacity factor.

- Evaporation rates coincident with summertime peak power demand are:

	Evap. Cooling Systems	Once-through Cooling
Nuclear	0.024	0.013
Fossil	0.017	0.0094

EVAPORATION RATES IN CFS PER MWe

(see Section V.F for further discussion)

Basis:

1) For cooling towers during summer, 90% of heat load rejected by evaporation

2) For once-through cooling during summer, 50% of heat load rejected by evaporation

3) Nuclear efficiency is 33%

4) Fossil efficiency is 40%

Table 5-19 FORECAST OF ELECTRIC SERVICE AREA

CAPACITY IN 1000's MWe

	Present Capacity 1974	Increase (1) During 1975-1990	Increase (1) During 1990-2000	Total (1) Capacity in 2000	Percent of Capacity
PRESENT TECHNOLOGY					
Nuclear - LWR & HTGR Steam	4.5	23.6	19.7	47.8	30
Fossil - Steam	28.8	10.5	8.5	47.8	30
Gas Turbine & Diesel	8.5	2.7	-	11.2	7
Hydroelectric	1.1	1.1	1.0	3.2	2
Pumped Storage	1.3	2.0	1.5	4.8	3
FUTURE TECHNOLOGY					
Nuclear - LMFBR	-	4	11.9	15.9	10
Nuclear - Gas Turbine HTGR	-	-	15.9	15.9	10
Fuel Cell	-	2.2	2.6	4.8	3
Solar Thermal & Wind	-	-	1.0	1.0	1
Geothermal	-	-	-	-	-
MHD	-	1.5	2.0	3.5	2
Other (Flywheel, Compressed Air Batteries, etc)	-	1.5	2.0	3.5	2
SUB-TOTAL	44.2	49.1	66.1	159.4	100
TOTAL	44.2	93.3	159.4	159.4	100

Notes (1) - Based on Reserve Capacity of 15%

SCENARIO A-1 AND A-2

BASIS FOR SCENARIOS B-1 AND B-2

Probable Low Power Demand - Nuclear Dominant Resource Mix

I. Electric Power Demand in the electric service area increases at an annual growth rate of 3.0% during 1975 - 1990 and 2.5% during 1991 - 2000.

Assumptions and Considerations (1975 - 2000)

- General economic growth is less than that experienced during 1950 - 1975.
- Population growth is 0.5% per year (avg)
- Per capita income growth is 2.3% per year (avg)
- Federal and state agencies are strongly committed to a strategy of reducing demand, recognizing that the problems associated with the fossil fuel crisis, the social/environmental effects of large numbers of power plants and a potential inability to finance a large supply do not have near-term solutions. In view of the uncertainty, a national effort to reduce electrical demand is activated.
- Peak demand price increases are implemented on a significant scale, and have a definite effect in reducing peak demand.
- Conservation measures (better insulation, better appliance efficiencies, reduced lighting requirements, constructing "low-energy" buildings, and others) are implemented by regulations and result in significant reduction in demand. Rationing is not needed.
- Solar space heating and cooling and water heating installations are strongly encouraged through tax incentives, and are significant in reducing demand.
- Substitution of electricity for fossil fuels is needed on a small-scale basis, but the overall effect on increasing demand is insignificant relative to the reductions in demand which result from other measures.

II. Electric Power Supply in the electric service area is provided by accelerated installations of nuclear power, with lesser dependence on coal gasification, oil and natural gas, and advanced energy conversion technologies.

Assumptions and Considerations (1975 - 2000)

- A strong national commitment to nuclear power evolves because:
  - Questions concerning nuclear safety, radioactive waste disposal, and environmental effects are resolved to the satisfaction of most public and political leaders.
  - A national energy policy limits the amounts of fossil fuels which can be used in producing electricity.
  - Coal gasification which could provide clean boiler fuel is limited because coal mining regulations continue to be stringent.
- The Liquid Metal Fast Breeder Reactor (LMFBR) development is successful, and commercial installations begin in the late 1980's. Thus, uranium fuel reserves are extended indefinitely.
- The Gas Turbine High Temperature Gas-Cooled Reactor (HTGR) development is successful, and commercial installations begin in the early 1990's. Dry cooling towers are used.
- Research and development of non-nuclear advanced energy conversion continues, but not with the strong commitment given to nuclear power:
  - Some installations of fuel cells, MHD generators, and flywheel generators are made during 1975 - 2000.
  - Some installations of compressed air storage plants are made during 1990 - 2000.
  - Fusion plants are not commercial by 2000.
- Based on the above assumptions, the resource mix in the electric service area by 2000 is projected to be:
  - Nuclear (35% of total installed capacity in 2000)
    - LWR and HTGR Steam (20%)
    - LMFBR and Gas Turbine HTGR (15%)

- Fossil (54%)
    - Steam (42%)
    - Gas Turbine and Diesel (12%)

- Hydroelectric (6%)
    - Conventional (2%)
    - Pumped Storage (4%)

- Advanced Energy Conversion (5%)
  Solar thermal, fuel cells, MHD, flywheels, compressed air storage, and others

III. Power Plant Siting in the electric service area

Assumptions and Considerations (1975 - 2000)

- Dry cooling is not used with the thermal plants because of prohibitive power penalties and additional costs. Dry cooling is used with the Gas Turbine HTGR.

- The four major siting subregions within the electric service area are defined as:

    - The Delaware River Basin (less the estuary portion of the Delaware Bay approximately south of Salem, N.J.); i.e. freshwater region of DRB

    - The Susquehanna River Basin - freshwater region

    - The Atlantic Coast, including offshore waters, and the Delaware Bay estuary region

    - Other portions of ESA

By 2000, the total capacity is assumed to be allocated for

Scenarios 1 and 2 as follows:

	Scenario 1	Scenario 2
DRB	30%	15%
SRB	30%	15%
Coastal	20%	50%
Other	20%	20%

The siting allocation in column 1 is representative of an increased siting rate in the DRB (and SRB) in comparison to the present trend (about 23%). Column 2 represents a decreased siting rate in the DRB (and SRB), with the coastal region being heavily called upon. This basically assumes that many nuclear plants would be sited offshore, and fossil plants would be sited at coastal and estuary locations.

- The EPA's power plant effluent control regulations are stringently enforced, and 75% of the above thermal plants in the DRB subregion use evaporative cooling (wet towers, spray canals, wet/dry towers) and 25% use once-through cooling. Similarly, the SRB has a 75/25 split. The coastal subregion is all once-through.

- Power plant water evaporation (1975 - 2000)

Evaporation is determined for peak periods, as opposed to annual averages or annual total consumption, because peak evaporation is the result of high power demand during the summer and occurs in coincidence with low river flows.

- At time of peak power demand, nuclear and fossil base load plants are assumed to be operating at 90% capacity factor.
- Evaporation rates coincident with summertime peak power demand are:

	Evap. Cooling Systems	Once-through Cooling
Nuclear	C.024	0.013
Fossil	0.017	0.0094

EVAPORATION RATES IN CFS PER MWe

(see Section V.F for further discussion)

Basis:

1) For cooling towers during summer, 90% of heat load rejected by evaporation
2) For once-through cooling during summer, 50% of heat load rejected by evaporation
3) Nuclear efficiency is 33%
4) Fossil efficiency is 40%

Table 5-20 FORECAST OF ELECTRIC SERVICE AREA

CAPACITY IN 1000's MWe

	Present Capacity 1974	Increase (1) During 1975-1990	Increase (1) During 1990-2000	Total (1) Capacity in 2000	Percent of Capacity
PRESENT TECHNOLOGY					
Nuclear - LWR & HTGR Steam	4.5	7.6	3.0	15.1	20
Fossil - Steam	28.8	1.4	1.5	31.7	42
Gas Turbine & Diesel	8.5	0.3	0.2	9.0	12
Hydroelectric	1.1	0.3	0.1	1.5	2
Pumped Storage	1.3	1.2	0.6	3.1	4
FUTURE TECHNOLOGY					
Nuclear - LMFBR	-	2.6	3	5.6	7.5
Nuclear - Gas Turbine HTGR	-	-	5.6	5.6	7.5
Fuel Cell	-	0.5	1.0	1.5	2
Solar Thermal & Wind	-	-	-	-	-
Geothermal	-	-	-	-	-
MHD	-	0.3	0.5	0.8	1
Other (Flywheel, Compressed Air Batteries, etc)	-	0.5	1.0	1.5	2
SUB-TOTAL	44.2	14.7	16.5	75.4	100
TOTAL	44.2	58.9	75.4	75.4	100

Notes (1) - Based on Reserve Capacity of 15%

SCENARIO B-1 AND B-2

BASIS FOR SCENARIOS C-1 and C-2

Probable High Power Demand - Nuclear Slowdown

I. Electric Power Demand in the electric service area increases at an annual growth rate of 6.0% during 1975 - 1990 and 5.5% during 1991 - 2000.

Assumptions and Considerations (1975 - 2000)

- General economic growth is similar to that experienced during 1950 - 1975, although somewhat reduced.
- Population growth is 1.3% per year (avg)
- Per capita income growth is 3.0% per year (avg)
- Electric power price increases are implemented on a low-key basis and have only a slight dampening effect on demand.
- Conservation measures; such as, better insulation in new buildings, increasing electric appliance efficiencies, reducing lighting requirements, constructing "low-energy" buildings; are implemented on a low-key basis. Rationing of electricity does not occur.
- Solar space heating and cooling and water heating installations in new buildings have a minor effect in reducing demand.
- The increasing scarcity of fossil fuels results in some substitution of electricity for such fuels. Development takes place in transportation electrification (autos, trucks, etc.) and converting end-use space heating, water heating, cooking, industrial processes, etc., to electricity. The "electric economy" offsets some of the gains in demand reduction achieved as a result of price increases, conservation measures, and use of solar energy.

II. Electric Power Supply in the electric service area is provided primarily by non-nuclear power generation. The resource mix

reflects accelerated development of coal gasification to provide "clean" fossil fuel, and accelerated R & D of advanced energy conversion technologies leading to commercial installations.

Assumptions and Considerations (1975 - 2000)

- Strong national opposition to the rapid expansion of nuclear power evolves because:

  - Nuclear safety, radioactive waste disposal, and environmental effects are of increasing concern to Congress, state regulatory agencies, and the general public. A significant slowdown in nuclear plant installations results.

  - The proponents of non-nuclear alternatives are successful in demonstrating that such alternatives can be developed on a commercial basis to meet the growing power demand with an attendant "go-slow" nuclear approach.

  - Some 6 - 10 states adopt laws which establish moratoriums on further nuclear construction until the problems are resolved.

- The federal government greatly accelerates the development of the non-nuclear alternatives with funding on the scale of the Apollo Program. Coal gasification, solar and wind power, geothermal, shale oil, fuel cells, MHD, fusion and others are developed on a priority basis.

- A national commitment is given to developing offshore oil on the east and west coasts. A large amount of this oil is dedicated as power plant fuel. Refinery capacity is increased to keep pace with the increased supplies of domestic oil.

- Environmental restrictions on coal mining and shale oil are relaxed to allow full-scale development of these resources, and air pollution regulations are made less stringent so that fossil fuels can be used as boiler fuels until "clean fuels" from gasification processes are commercial on a large-scale basis.

- Hydroelectric and pumped storage power potential is developed to the maximum possible extent.

- Continued research on resolving nuclear problems results in success, but nuclear plant installations do not become an important factor again until the early 1990's. Commercial installations of the LMFBR and HTGR gas turbine occur in the late 1990's.

- Commercial development of fusion is still not achieved by 2000.
- Based on the above assumptions, the resource mix in the electric service area by 2000 is projected to be:

  - Fossil-based (55% of installed capacity in 2000)
    - Steam (48%)
    - Gas Turbines and Diesel (7%)

  - Nuclear (20%)
    - LWR and HTGR Steam (10%)
    - LMFBR and Gas Turbine HTGR (10%)

  - Hydroelectric (10%)
    - Conventional (3%)
    - Pumped Storage (7%)

  - Advanced Energy Conversion (15%)
    - Solar thermal (and wind) (3%)
    - Fuel cells (3%)
    - Geothermal (3%)
    - MHD (2%)
    - Other (flywheels, compressed air, etc.) (4%)

III. Power Plant Siting in the electric service area

Assumptions and Considerations (1975 - 2000)

- Dry cooling is not used with the thermal plants because of prohibitive power penalties and additional costs. Dry cooling is used with the Gas Turbine HTGR.
- The four major siting subregions within the electric service area are defined as:

  - The Delaware River Basin (less the estuary portion of the Delaware Bay approximately south of Salem, N.J.); i.e. freshwater region of DRB

  - The Susquehanna River Basin - freshwater region

  - The Atlantic Coast, including offshore waters, and the Delaware Bay estuary region

  - Other portions of ESA

By 2000, the total capacity is assumed to be allocated for

Scenarios 1 and 2 as follows:

	Scenario 1	Scenario 2
DRB	30%	15%
SRB	30%	15%
Coastal	20%	50%
Other	20%	20%

The siting allocation in column 1 is representative of an increased siting rate in the DRB (and SRB) in comparison to the present trend (about 23%). Column 2 represents a decreased siting rate in the DRB (and SRB), with the coastal region being heavily called upon. This basically assumes that many nuclear plants would be sited *offshore*, and fossil plants would be sited at coastal and estuary locations.

- The EPA's power plant effluent control regulations are stringently enforced, and 75% of the above thermal plants in the DRB subregion use evaporative cooling (wet towers, spray canals, wet/dry towers) and 25% use once-through cooling. Similarly, the SRB has a 75/25 split. The coastal subregion is all once-through.

- Power plant water evaporation *(1975 - 2000)*

  Evaporation is determined for peak periods, as opposed to annual averages or annual total consumption, because peak evaporation is the result of high power demand during the summer and occurs in coincidence with low river flows.

  - At time of peak power demand, nuclear and fossil base load plants are assumed to be operating at 90% capacity factor.

  - Evaporation rates coincident with summertime peak power demand are:

	Evap. Cooling Systems	Once-through Cooling
Nuclear	0.024	0.013
Fossil	0.017	0.0094

EVAPORATION RATES IN CFS PER MWe

(see Section V.F for further discussion)

Basis: 1) For cooling towers during summer, 90% of heat load rejected by evaporation

2) For once-through cooling during summer, 50% of heat load rejected by evaporation

3) Nuclear efficiency is 33%

4) Fossil efficiency is 40%

Table 5-21 FORECAST OF ELECTRIC SERVICE AREA

CAPACITY IN 1000's MWe

	Present Capacity 1974	Increase (1) During 1975-1990	Increase (1) During 1990-2000	Total (1) Capacity in 2000	Percent of Capacity
PRESENT TECHNOLOGY					
Nuclear - LWR & HTGR Steam	4.5	3.4	8.0	15.9	10
Fossil - Steam	28.8	27.6	20.1	76.5	48
Gas Turbine & Diesel	8.5	1.6	1.0	11.1	7
Hydroelectric	1.1	2.7	1.0	4.8	3
Pumped Storage	1.3	7.0	2.8	11.1	7
FUTURE TECHNOLOGY					
Nuclear - LMFBR	-	-	8.0	8.0	5
Nuclear - Gas Turbine HTGR	-	-	8.0	8.0	5
Fuel Cell	-	3.0	1.8	4.8	3
Solar Thermal & Wind	-	-	4.8	4.8	3
Geothermal	-	-	4.8	4.8	3
MHD	-	0.8	2.4	3.2	2
Other (Flywheel, Compressed Air Batteries, etc)	-	3.0	3.4	6.4	4
SUB-TOTAL	44.2	49.1	66.1	159.4	100
TOTAL	44.2	93.3	159.4	159.4	100

Notes (1) - Based on Reserve Capacity of 15%

SCENARIO C-1 AND C-2

BASIS FOR SCENARIOS D-1 AND D-2

Probable Low Power Demand - Nuclear Slowdown

I. Electric Power Demand in the electric service area increases at an annual growth rate of 3.0% during 1975 - 1990 and 2.5% during 1991 - 2000.

Assumptions and Considerations (1975 - 2000)

- General economic growth is less than that experienced during 1950 - 1975.
- Population growth is 0.5% per year (avg)
- Per capita income growth is 2.3% per year (avg)
- Federal and state agencies are strongly committed to a strategy of reducing demand, recognizing that the problems associated with the fossil fuel crisis, the social/environmental effects of large numbers of power plants and a potential inability to finance a large supply do not have near-term solutions. In view of the uncertainty, a national effort to reduce electrical demand is activated.
- Peak demand price increases are implemented on a significant scale, and have a definite effect in reducing peak demand.
- Conservation measures (better insulation, better appliance efficiencies, reduced lighting requirements, constructing "low-energy" buildings, and others) are implemented by regulations and result in significant reduction in demand. Rationing is not needed.
- Solar space heating and cooling and water heating installations are strongly encouraged through tax incentives, and are significant in reducing demand.
- Substitution of electricity for fossil fuels is needed on a small-scale basis, but the overall effect on increasing demand is insignificant relative to the reductions in demand which result from other measures.

II. Electric Power Supply in the electric service area is provided

primarily by non-nuclear power generation. The resource mix reflects accelerated development of coal gasification to provide "clean" fossil fuel, and accelerated R & D of advanced energy conversion technologies leading to commercial installations.

Assumptions and Considerations (1975 - 2000)

- Strong national opposition to the rapid expansion of nuclear power evolves because:
  - Nuclear safety, radioactive waste disposal, and environmental effects are of increasing concern to Congress, state regulatory agencies, and the general public. A significant slowdown in nuclear plant installations results.
  - The proponents of non-nuclear alternatives are successful in demonstrating that such alternatives can be developed on a commercial basis to meet the growing power demand with an attendant "go-slow" nuclear approach.
  - Some 6 - 10 states adopt laws which establish moratoriums on further nuclear construction until the problems are resolved.
- The federal government greatly accelerates the development of the non-nuclear alternatives with funding on the scale of the Apollo Program. Coal gasification, solar and wind power, geothermal, shale oil, fuel cells, MHD, fusion and others are developed on a priority basis.
- A national commitment is given to developing offshore oil on the east and west coasts. A large amount of this oil is dedicated as power plant fuel. Refinery capacity is increased to keep pace with the increased supplies of domestic oil.
- Environmental restrictions on coal mining and shale oil are relaxed to allow full-scale development of these resources, and air pollution regulations are made less stringent so that fossil fuels can be used as boiler fuels until "clean fuels" from gasification processes are commercial on a large-scale basis.
- Hydroelectric and pumped storage power potential is developed to the maximum possible extent.
- Continued research on resolving nuclear problems results in success, but nuclear plant installations do not become an important factor again until the early 1990's. Commercial installations of the LMFBR and HTGR gas turbine occur in the late 1990's.

- Commercial development of fusion is still not achieved by 2000.

- Based on the above assumptions, the resource mix in the electric service area by 2000 is projected to be:

  - Fossil (58%)

  - Nuclear (23%)
    - LWR and HTGR steam (15%)
    - LMFBR and Gas Turbine HTGR (8%)

  - Hydroelectric (9%)
    - Conventional (3%)
    - Pumped Storage (6%)

  - Advanced Energy Conversion (10%)
    - Solar thermal (and wind) (2%)
    - Fuel Cell (2%)
    - Geothermal (2%)
    - MHD (2%)
    - Other (flywheels, compressed air, etc.) (2%)

III. Power Plant Siting in the electric service area

Assumptions and Considerations (1975 - 2000)

- Dry cooling is not used with the thermal plants because of prohibitive power penalties and additional costs. Dry cooling is used with the Gas Turbine HTGR.

- The four major siting subregions within the electric service area are defined as:

  - The Delaware River Basin (less the estuary portion of the Delaware Bay approximately south of Salem, N.J.); i.e. freshwater region of DRB

  - The Susquehanna River Basin - freshwater region

  - The Atlantic Coast, including offshore waters, and the Delaware Bay estuary region

  - Other portions of ESA

By 2000, the total capacity is assumed to be allocated for

Scenarios 1 and 2 as follows:

	Scenario 1	Scenario 2
DRB	30%	15%
SRB	30%	15%
Coastal	20%	50%
Other	20%	20%

The siting allocation in column 1 is representative of an increased siting rate in the DRB (and SRB) in comparison to the present trend (about 23%). Column 2 represents a decreased siting rate in the DRB (and SRB), with the coastal region being heavily called upon. This basically assumes that many nuclear plants would be sited offshore, and fossil plants would be sited at coastal and estuary locations.

- The EPA's power plant effluent control regulations are stringently enforced, and 75% of the above thermal plants in the DRB subregion use evaporative cooling (wet towers, spray canals, wet/dry towers) and 25% use once-through cooling. Similarly, the SRB has a 75/25 split. The coastal subregion is all once-through.

- Power plant water evaporation (1975 - 2000)

Evaporation is determined for peak periods, as opposed to annual averages or annual total consumption, because peak evaporation is the result of high power demand during the summer and occurs in coincidence with low river flows.

- At time of peak power demand, nuclear and fossil base load plants are assumed to be operating at 90% capacity factor.

- Evaporation rates coincident with summertime peak power demand are:

	Evap. Cooling Systems	Once-through Cooling
Nuclear	0.024	0.013
Fossil	0.017	0.0094

EVAPORATION RATES IN CFS PER MWe

(see Section V.F for further discussion)

- **Commercial development of fusion is still not achieved by 2000.**
- **Based on the above assumptions, the resource mix in the electric service area by 2000 is projected to be:**

- Fossil (58%)
- Nuclear (23%)
  - LWR and HTGR steam (15%)
  - LMFBR and Gas Turbine HTGR (8%)
- Hydroelectric (9%)
  - Conventional (3%)
  - Pumped Storage (6%)
- Advanced Energy Conversion (10%)
  - Solar thermal (and wind) (2%)
  - Fuel Cell (2%)
  - Geothermal (2%)
  - MHD (2%)
  - Other (flywheels, compressed air, etc.) (2%)

III. Power Plant Siting in the electric service area

Assumptions and Considerations (1975 - 2000)

- Dry cooling is not used with the thermal plants because of prohibitive power penalties and additional costs. Dry cooling is used with the Gas Turbine HTGR.
- The four major siting subregions within the electric service area are defined as:
  - The Delaware River Basin (less the estuary portion of the Delaware Bay approximately south of Salem, N.J.); i.e. freshwater region of DRB
  - The Susquehanna River Basin - freshwater region
  - The Atlantic Coast, including offshore waters, and the Delaware Bay estuary region
  - Other portions of ESA

By 2000, the total capacity is assumed to be allocated for

Scenarios 1 and 2 as follows:

	Scenario 1	Scenario 2
DRB	30%	15%
SRB	30%	15%
Coastal	20%	50%
Other	20%	20%

The siting allocation in column 1 is representative of an increased siting rate in the DRB (and SRB) in comparison to the present trend (about 23%). Column 2 represents a decreased siting rate in the DRB (and SRB), with the coastal region being heavily called upon. This basically assumes that many nuclear plants would be sited offshore, and fossil plants would be sited at coastal and estuary locations.

- The EPA's power plant effluent control regulations are stringently enforced, and 75% of the above thermal plants in the DRB subregion use evaporative cooling (wet towers, spray canals, wet/dry towers) and 25% use once-through cooling. Similarly, the SRB has a 75/25 split. The coastal subregion is all once-through.

- Power plant water evaporation (1975 - 2000)

  Evaporation is determined for peak periods, as opposed to annual averages or annual total consumption, because peak evaporation is the result of high power demand during the summer and occurs in coincidence with low river flows.

  - At time of peak power demand, nuclear and fossil base load plants are assumed to be operating at 90% capacity factor.

  - Evaporation rates coincident with summertime peak power demand are:

	Evap. Cooling Systems	Once-through Cooling
Nuclear	0.024	0.013
Fossil	0.017	0.0094

EVAPORATION RATES IN CFS PER MWe

(see Section V.F for further discussion)

Basis:

1) For cooling towers during summer, 90% of heat load rejected by evaporation

2) For once-through cooling during summer, 50% of heat load rejected by evaporation

3) Nuclear efficiency is 33%

4) Fossil efficiency is 40%

Table 5-22 FORECAST OF ELECTRIC SERVICE AREA

CAPACITY IN 1000's MWe

	Present Capacity 1974	Increase[(1)] During 1975-1990	Increase[(1)] During 1990-2000	Total[(1)] Capacity in 2000	Percent of Capacity
PRESENT TECHNOLOGY					
Nuclear - LWR & HTGR Steam	4.5	3.5	3.3	11.3	15
Fossil - Steam	28.8	4.6	1.3	34.7	46
Gas Turbine & Diesel	8.5	0.4	0.1	9.0	12
Hydroelectric	1.1	1.0	0.2	2.3	3
Pumped Storage	1.3	2.7	0.5	4.5	6
FUTURE TECHNOLOGY					
Nuclear - LMFBR	-	-	3.0	3.0	4.0
Nuclear - Gas Turbine HTGR	-	-	3.0	3.0	4.0
Fuel Cell	-	1.0	0.6	1.6	2.0
Solar Thermal & Wind	-	-	1.5	1.5	2.0
Geothermal	-	-	1.5	1.5	2.0
MHD	-	0.5	1.0	1.5	2.0
Other (Flywheel, Compressed Air Batteries, etc)	-	1.0	0.5	1.5	2.0
SUB-TOTAL	44.2	14.7	16.5	75.4	100
TOTAL	44.2	58.9	75.4	75.4	100

Notes (1) - Based on Reserve Capacity of 15%

SCENARIO D-1 AND D-2

V.F. PROJECTED POWER PLANT WATER CONSUMPTION

V.F.1 TYPES OF COOLING SYSTEMS

There are several types of cooling systems which are being used in the power industry; or, which could be used, but at great additional expense. The available methods are briefly described in this section, and the basis for projected water consumption is discussed in the following section.

Once Through Cooling System

Once through cooling systems are a highly developed and efficient means for transporting waste heat from the condenser of a steam electric power plant to the environment. The once through cooling system is generally the the most economical and the most efficient cooling system associated with large power plants. Potential environmental impacts associated with the acceptance of the relatively large quantities of waste heat by the environment often cause planners and engineers to turn to other cooling alternatives.

The Environmental Protection Agency has studied the problems associated with once through cooling and has provided a means by which the system can be used in those cases where it can be demonstrated that acceptable environmental impact can be reasonably achieved (Section 316 exemption per PL 92-500). It remains unclear at this time as to how many existing and future steam plants will be able to use once through systems under the Environmental Protection Agency requirements. Because of this uncertainty, the once

through system could be limited in its use for large thermal power plants in the future.

Wet Cooling Tower Systems

Wet cooling tower systems are in many cases technically and economically practical for applications to present day steam electric power plants. The costs of wet cooling systems are generally well above those of the once through cooling system; however, this type of system is becoming predominant as a means for complying with current regulatory requirements in regard to EPA's effluent limitations.

The potential problems of wet cooling towers are:

- Subject to mechanical failure.
- High capital cost.
- High operation and maintenance costs.
- High evaporative water losses.
- Blowdown disposal problems.
- Local meteorological effects (fogging, icing, drift)

Wet Cooling Spray Systems and Cooling Ponds (Lakes)

These methods recirculate the cooling water as in the case of using cooling towers. The warmed condenser effluent released to a cooling pond (lake) releases its heat to the atmosphere via evaporation, conduction,

and radiation before returning to the cooling water intake. If the warmed effluent is sprayed into the air using a suitable spray system, most of the heat is rejected by evaporation, much like cooling towers. Spray pond systems require much less surface area in comparison with cooling ponds (lakes).

Wet/Dry Cooling Systems

Wet/dry cooling systems are technically feasible, and can eliminate some disadvantages of the wet cooling system. For example, localized icing and fogging can be systematically eliminated by the proper operation of the wet/dry system, and water consumption can be reduced. The cost of this system is higher than the conventional wet system; however, the wet/dry system will be used in the future as a means for solving cooling problems at sites where the additional cost provides commensurate benefits in the elimination of potential environmental impacts and reducing water consumption.

Dry Cooling Systems

Dry cooling systems are technically feasible for application with steam electric power plants; however, the high back pressures associated with the dry system are not compatible with current turbine designs. This factor makes the application of dry cooling very expensive because of losses in plant efficiency and the costs of the dry system itself.

The dry cooling system will resolve concerns over environmental quality and will allow siting of power plants in areas where the availability of cooling water is limited. But the problems associated with the relatively high turbine exhaust pressures, and the extremely costly hardware expenses, retard the expected commercial development of the dry cooling system for use with steam plants. As mentioned in another section, dry cooling will be compatible and economic with the gas turbine HTGR.

Economics of Dry and Wet/Dry Cooling

Several comprehensive cost studies have been made on the economics of dry and wet/dry cooling systems. A comprehensive evaluation of dry towers for an 1100MWe (approx) nuclear plant near Philadelphia showed that the incremental generation cost relative to using evaporative cooling towers is 1.37 mills/kwh (Westinghouse, 1972). This study assumed that plant operation starts in 1978, and the incremental cost includes charges for plant capability loss, increased fuel consumption, increased capital costs, and increased operating/maintenance costs.

The magnitude of the increased cost burden associated with using dry cooling instead of wet cooling can be estimated by using this incremental cost factor. To illustrate, the 1990 electric energy consumption in the Pennsylvania - New Jersey - Maryland (PJM) service area (which is about 95 per cent of the electric service area) would be approximately 370 billion kwh/year for the probable high annual growth rate of 6.0 per cent, and it

would be about 240 billion kwh/year for the probable low annual growth rate of 3.0 per cent. If half the 1990 electric energy were supplied by dry-cooled power plants, the additional annual costs relative to using wet cooling for these plants would be approximately:

High Growth: $250,000,000 additional per year

Low Growth: $165,000,000 additional per year

To provide further perspective on the additional costs involved, consider an 1100 MWe nuclear unit operating at an 80 per cent capacity factor for a year. It produces 7.7 billion kwh, and the associated additional cost for dry cooling instead of wet cooling is about $10,600,000 for the year. If the plant had used wet cooling, about 20,000 acre-feet[1] of water would have been evaporated. Thus, if water is worth $530/acre-foot, dry cooling might be justified; otherwise, a decision to use it would have to be made for other reasons.

The costs of wet-dry cooling are roughly proportional to the amounts of dry and wet cooling provided in a particular application, as would be expected (Cornell, 1972). For example, using 1.37 mills/kwh as the incremental dry cooling cost relative to wet cooling, a 50% wet - 50% dry tower system would have an associated incremental cost relative to wet cooling of about 0.69 mills/kwh. This wet/dry system would also conserve about 60-80% of the water that would be evaporated by wet cooling alone. Assuming 70 per cent water conservation, the 1100 MWe plant using a 50%

(1) 1 cfs = 725 acre-feet per year (approx)

dry system would save 15,000 acre-feet/year. The additional wet-dry annual cooling cost relative to wet cooling is about $5,300,000 (7.7 billion kwh x .69 mills/kwh). Thus, if water is worth about $355/acre-foot, the wet-dry cooling system might be justified. Optimizations in the wet-dry system could be expected to further reduce this cost, but probably not significantly. In any case, the wet-dry concept is more cost effective than using dry cooling alone, but would still have to be justified on a case-by-case basis if used instead of once through or wet cooling.

Evaluation of Cooling Systems for ESA

In view of the significantly higher costs associated with using dry and wet-dry cooling, it is not considered to be generally feasible to equip new nuclear and fossil steam plants with them. It is suggested that either evaporative systems or once-through cooling be viewed as the realistic cooling options for ESA steam plants. As indicated previously, the gas turbine HTGR cycle is compatible with dry cooling, and it is expected that commercial installations of this cycle in the 1990's will be made using dry cooling.

As the scenarios have shown, many of the new plants installed during 1975-2000 will be nuclear and/or fossil steam. This result holds for higher or lower power demand, for rapid nuclear expansion or nuclear slowdown, and for slower or accelerated development of advanced technologies. If one also accepts the conclusion that evaporative or once-through cooling should be used with these steam plants, it is in order to further suggest that providing water resources for these cooling processes is both necessary and

appropriate.

Regardless of whether 30 per cent of 15 per cent of the ESA power generation capacity by 2000 is located in the DRB, it is evident that some fresh water needs to be allocated to power plant cooling. It appears prudent for ESA planners and decision-makers to decide on a rational and practical siting program which recognizes the water needs to support power generation.

V.F.2 WATER CONSUMPTION

Potential future water consumption is shown on the scenarios. The evaporation rates per MWe of nuclear and fossil demand were stated in the assumptions for each.

The rates were calculated based on summertime conditions in the DRB. A wet bulb temperature of $75^{\circ}F$ was used as being representative of the 95 percentile for the four warmest months (FPC, 1969). Performing a thermodynamic analysis of a cooling tower operating under the DRB's meteorological conditions, it was determined that evaporation rate per nuclear MWe output is about 0.024 cfs/MWe. This rate agrees with those developed by Oleson and Hauser (1970) and Leung and Moore(1970). Since a nuclear plant rejects about 40 to 50 per cent more heat per MWe than a fossil plant, the evaporation rate per fossil MWe is about 0.017 cfs/MWe. These calculations assumed that during summertime operation, 90 per cent of the heat is rejected in the tower by evaporation, and the other 10 per cent

is rejected by sensible heat transfer.

To estimate water evaporation resulting from once-through cooling, it is necessary to determine the amount of plant-added heat rejected by forced evaporation, conduction, and back radiation. By using formulae which characterize the heat loss at the water surface (Edinger et al, 1974), it can be shown that during the summer about half of the plant-added heat is ultimately rejected by forced evaporation with the other being lost via conduction and back radiation. Therefore, the once-through cooling evaporation rate per nuclear MWe output is about 0.013 cfs/MW and the rate per fossil MWe output is about 0.0094 cfs/MW. Each scenario shows the amount of nuclear and fossil thermal capacity in the DRB by 2000. Thus, estimates of evaporation are readily calculated after deciding how much of this thermal capacity uses evaporative cooling and how much uses once-through cooling. In view of the great uncertainty involving the future implementation of EPA's new power plant effluent limitations, it is assumed that the future cooling tower to once-through ratio could be on the order of 3:1 for stringent implementation, and would be on the order of 1:3 for liberal implementation (or a change in the water law-PL 500).

The intent has been to make evaporation estimates for the fresh water portion of the DRB. Accordingly, the coastal subregion was chosen to include the Delaware Bay estuary upstream to the proximity of Artificial Island. A recent study indicated that the effects of power plant evaporation on fresh water flows in the Delaware basin are negligible for plants located downstream of this point (Englesson, 1974). For example, it was

stated that the Salem plant, under construction near Artificial Island, will require only 20 per cent of the storage which would be required if the plant were sited on a fresh water portion of the river. Therefore, assuming that plants upstream of Artificial Island are evaporating fresh-water means that evaporation is being estimated in a conservative manner. Even plants located several miles upstream of Artificial Island are using brackish water and have substantially less effect on fresh water consumption than those further upstream in the pure freshwater regime.

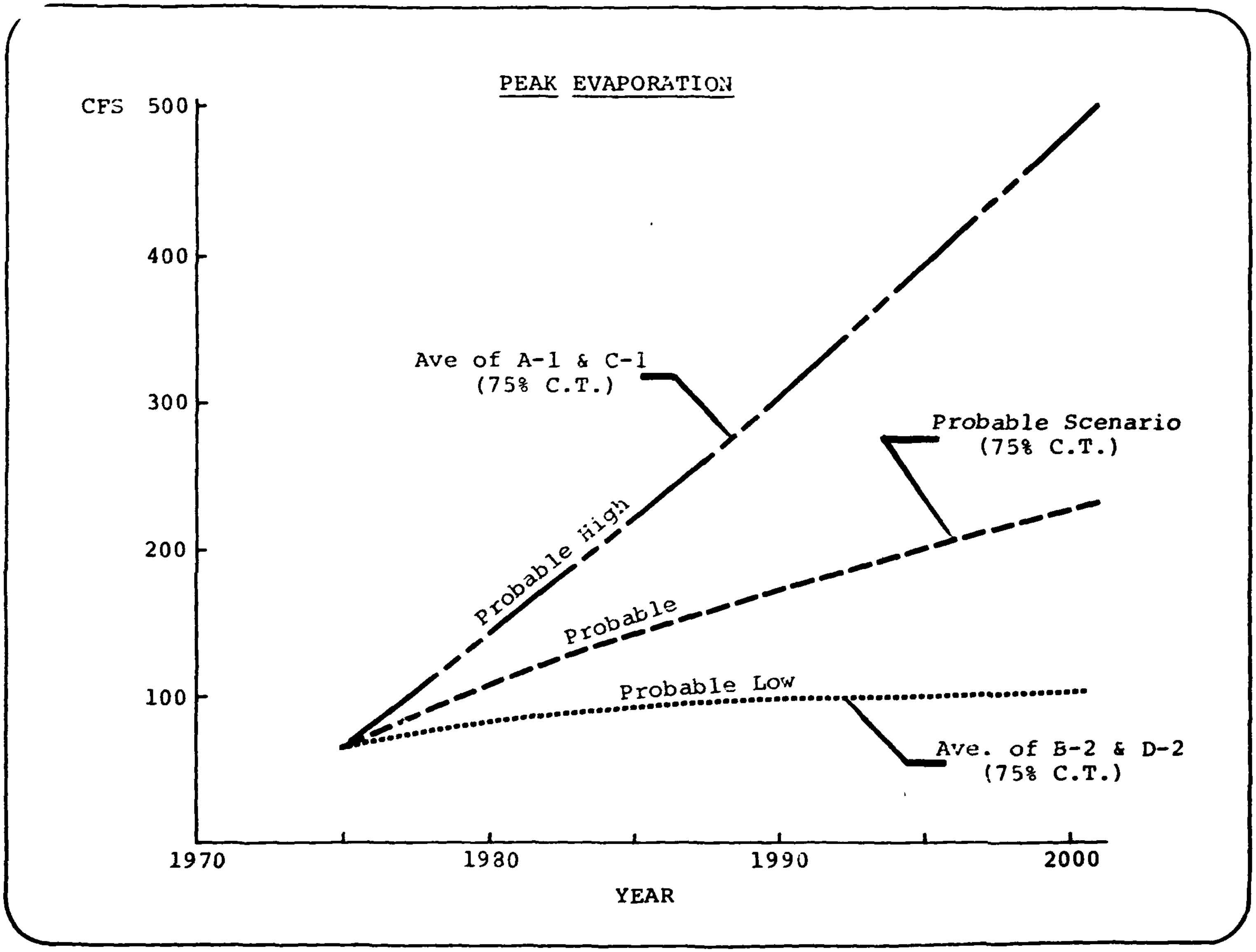
Each scenario shows two power plant evaporation curves based on the EPA assumptions (see Tables 5-10 to 5-18). To compare the relative differences, Table 5-23 shows water consumption for all scenarios. The wide range of values illustrates the high sensitivity of power plant evaporation to power demand, plant type, plant location and cooling method. Figure 9 shows probable high, probable and probable low water consumption curves. The probable high curve is taken as the average of water consumption for Scenarios A-1 and C-1, the probable curve was derived from the probable scenario, and the probable low curve is taken as the average of water consumption for Scenarios B-2 and D-2. All three curves are based on 75 per cent cooling towers and 25 per cent once-through. There obviously are other ways to average the scenarios in deriving such curves.

In planning for future water needs alone, it is seen that an overall regional siting strategy is needed so that the quantities of water to be

Table 5-23 ESTIMATES OF PEAK EVAPORATION FROM POWER PLANT COOLING IN THE DELAWARE RIVER BASIN

(1 CFS ≅ 0.646 MGD ≅ 725 A-F/yr)

SCENARIO NO.	THERMAL CAPACITY WITH COOLING TOWERS, %	ESTIMATE OF PEAK EVAPORATION RATE, CFS	
		1990	2000
A-1	75	344	542
A-1	25	257	403
A-2	75	172	256
A-2	25	128	190
B-1	75	207	232
B-1	25	154	173
B-2	75	104	111
B-2	25	77	83
C-1	75	275	442
C-1	25	206	331
C-2	75	138	174
C-2	25	103	129
D-1	75	182	210
D-1	25	136	157
D-2	75	91	95
D-2	25	68	71
"Probable"	75	190	226
"Probable"	25	140	168


PEAK EVAPORATION
CFS
500
400
300
200
100
1970
1980
1990
2000
YEAR
Ave of A-1 & C-1 (75% C.T.)
Probable High
Probable
Probable Low
Probable Scenario (75% C.T.)
Ave. of B-2 & D-2 (75% C.T.)

9

allocated for thermal plant cooling can be accurately forecasted.

Several factors do tend to make such estimates conservative:

1. Overall nuclear efficiency was assumed to be 33% in all calculations; however, the HTGR steam plant (39-40%) and the LMFBR (35-35%) efficiencies will result in lower heat rates, hence water evaporation would be reduced.

2. Assuming that the river upstream of Artificial Island is all fresh water.

A factor which acts in the opposite direction is the assumption of relatively large amounts of gas turbine HTGR capacity cooled with dry towers.

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VI.A. DELAWARE RIVER BASIN CHARACTERISTICS

The Delaware River and its tributaries drain approximately 13,000 square miles of land. A complete characterization of this basin can be gained from examination of Chapter I; the characterization presented herein is from a water quality viewpoint and will therefore deal with the character of the point and non-point sources and contributing waters to the Delaware River. Point sources are defined as pollution loads discharging from a pipe or conduit. Non-point sources consist of spatially distributed pollution loads entering water courses at non-specific points as a result of urban runoff, agriculture, silviculture activities, etc.

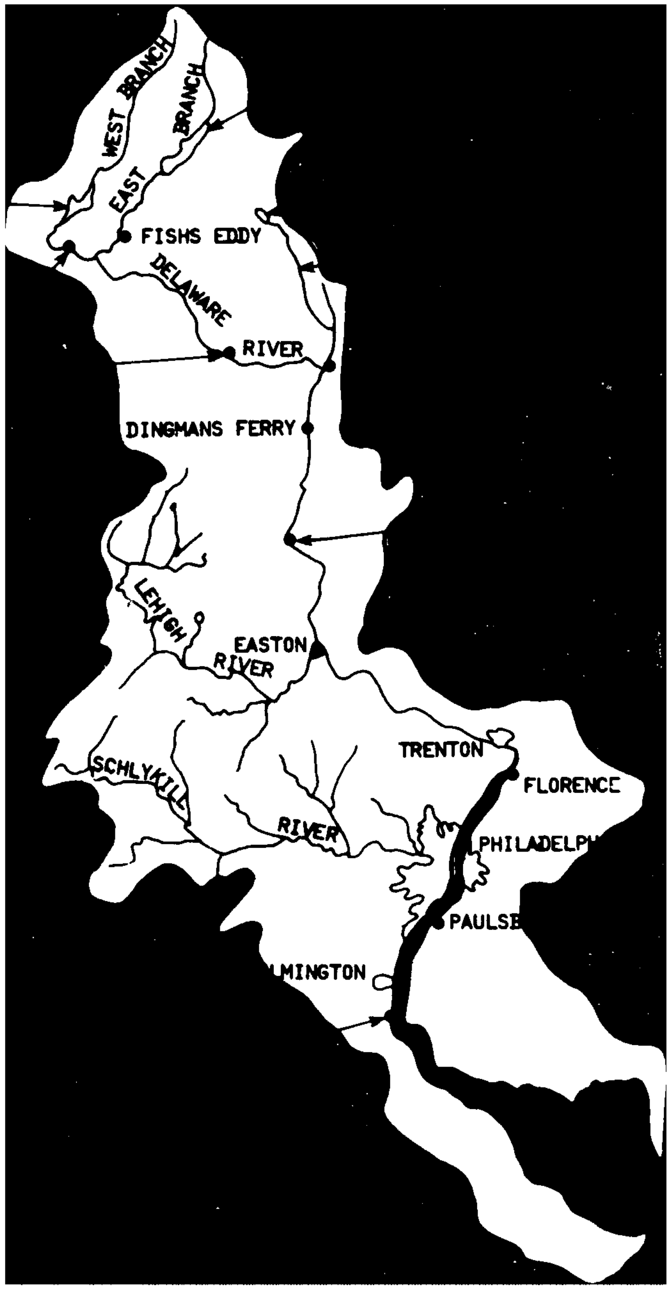
The study area has been divided into three major sections; the upper basin, the contiguous area, and the lower reach and estuary. The upper basin is defined as the mainstem of the Delaware River and tributaries above Port Jervis. The contiguous area is that area defined within the Tocks Island Region Environmental Study (TIRES) and includes areas from the states of New York, New Jersey and Pennsylvania. The lower reach of the Delaware River includes

the mainstem belo·. Tocks Island and extends through Trenton and into Philadelphia. The estuary area extends south of Philadelphia and into Delaware Bay thereby including portions of the State of Delaware. Figure 6-1 deliniates the water quality service area.

VI.A.I UPPER BASIN

VI.A.I(a) Features

The drainage basin contributing to the upper reach of the Delaware River above Port Jervis comprises 3,076 square miles and was estimated by the DRBC (Eleventh Water Resources Program, September 1974) to contribute 5,530 cfs as average runoff over the water years 1905 - 1970. Therefore, the upper reach (upper basin) contributed to 24 percent of the total drainage area and 27 percent of the total flow. The mainstem of the Delaware River is fed by three medium sized tributaries directly above Port Jervis (Neversink, Mongaup, and Lackawaxen Rivers) and two mainstem tributaries (West Branch and East Branch) located in the State of New York. New York State has three water supply reservoirs within the area: the Neversink Reservoir on the Neversink River, the Pepacton Reservoir on the East Branch of the Delaware River, and Cannonsville Reservoir on the West Branch of the Delaware River. The upper Delaware River Basin includes Wayne and Pike Counties in Pennsylvania and Delaware, Sullivan and Orange Counties in New York. Elevations within the upper basin lie mostly between 1,000 and 2,000 feet above sea level. The topography of the immediate area is characterized by rugged hillside broken only by the clearings



WEST BRANCH
EAST BRANCH
FISHS EDDY
DELAWARE
RIVER
DINGMANS FERRY
LEHIGH
EASTON
RIVER
TRENTON
FLORENCE
SCHLYKILL
RIVER
PHILADELPH
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A COMPREHENSIVE STUDY OF THE TOCKS ISLAND LAKE PROJECT AND ALTE--ETC(U)

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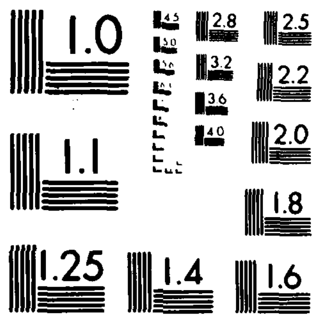
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1.1
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1.4
1.6
1.8
2.0
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2.5
2.8
3.2
3.6
4.0

made by small settlements in the area.

The climate of the area is characterized by frequent changes in weather common to mid-latitude climates. Precipitation is fairly evenly distributed throughout the year and provides approximately 45 inches of rain annually.

Forest land occupies most of the upper basin area (84 percent as of the 1973 "Upper Delaware River Study" prepared by the U.S. Department of the Interior, Bureau of Outdoor Recreation). These forests consist primarily of second and third growth oak, hickory, beech, birch and maple with some conifers and brush. This area, which is used for recreation, is a major contributor because of its areal predominance to natural non-point source discharges. Drainage of the upper basin is typical of dissected plateaus (dendritic drainage pattern). Approximately 7 percent of the area is devoted to agricultural uses and 9 percent of the upper basin is classed as developed. This includes small small communities and few mid-sized towns having no significant industrial discharge. Land ownership of the upper basin is largely private with some publicly owned lands.

The chief agricultural uses are farming, poultry processing, and dairying. Sullivan County is a primary site for chicken farm operations with an estimated bird population of 2.3 million (Water Quality Management Plan, January 1975). These chickens annually produce about 87,200

tons of manure or about 240 tons/day. Runoff from the poultry farms is considered a contributor to the non-point source load of the Mangaup, the Neversink and finally, the mainstem of the Delaware River. Runoff from the farm byproduct (fertilizer) is also classed among the nonpoint sources.

The majority of the dairy farms are located in Delaware County, New York. Runoff from these farms will enter the West Branch of the Delaware River and therefore, Cannonsville Reservoir. Much of the manure gathered from the dairy cows is spread to dry on land adjacent to the farm, or used for fertilization of crop lands. Other sources of waste contaminant from man-related activities in the Upper Basin include: sediment from land runoff, inorganic salts and minerals from irrigation, rural domestic wastes, and pesticides. Runoff from roads and highways is another source of waste contaminants (both sediment and inorganic salts).

VI.A.I(b) Water Quality

The Upper Basin includes the East and West Branches of the Delaware River and the Delaware River itself from Hancock to Port Jervis. As shown in Table 6-1, which indicates the chemical and physical quality during the critical low-flow summer period, the quality of these waters is excellent. During other parts of the year, the quality is even better. This is primarily due to the greater flows and lower temperatures which provide greater dilution capacity and retard biological

Table 6-1 Upper Basin Water Quality, Summer Mean Values
(July - September)

CONSTITUENT, mg/l UNLESS OTHERWISE INDICATED	WEST BRANCH DELAWARE RIVER AT HALE EDDY[a]	EAST BRANCH DELAWARE RIVER AT FISH EDDY	DELAWARE RIVER AT NARROWSBURG
D.O.	10.8	9.9	8.6
pH	6.9	7.7	7.2
BOD_5	-	-	1.1
COD	5.0	4.7	-
Temperature, ^{o}C	14.0	21.0	21.0
Nitrogen, Total as N	0.93	0.20	0.51
Phosphorus, Total as P	0.018	0.014	0.025
Fecal Coliforms /100 ml	68	18	104
Alkalinity, Total as $CaCO_3$	16.0	14.0	14.0
Hardness, Total as $CaCO_3$	27.0	8.0[b]	-

Source: USGS, 1973-1974 water quality records

a. 1973 data only
b. 1974 data only

growth. Average dissolved oxygen varied from 8.6 to 10.8 mg/1, while coliform levels varied from 18 to 104 per 100 ml. Alkalinity and hardness were both low, averaging about 15 and 18 mg/1 respectively. Figure 6-1 indicates the relative position of these sampling points in relation to the whole basin.

The water quality objectives against which the ambient water quality should be compared are listed in the DRBC Water Code, are discussed in VI.B.1 and are contained in Appendix (1). Conformance of the numerical water quality values listed in Table 6-1 with the water quality objectives of the DRBC does not necessarily assure compliance with these stated objectives. For example, the water quality objectives state that the D.O. must be maintained above 4.0 mg/1 at all times. According to Table 6-1 the D.O. does not fall below 8.6 mg/1. However, *compliance is not necessarily* reflected in these values because of the limited sampling frequency and number of locations.

More extreme variations in these parameters occur in selected regions and diurnally. A dissolved oxygen sag has been noted in the West Branch of the Delaware upstream of Cannonsville Reservoir and downstream of two sewage treatment plant outfalls. This is discussed more fully in VI.A.4. Large diurnal variations in pH, alkalinity and D.O. occur in some reaches due to the activity of aquatic weeds, attached algae and planktonic algae.

Diurnal variations in D.O. in the West Branch of the Delaware upstream of Cannonsville as large as 7 mg/l have been noted. Large extremes in temperature due to release of cold reservoir waters have also been noted (Water Quality Management Plan, Jan. 1975).

As these temperature variations are of particular importance to the viability of existing and future resources, a more complete discussion of upstream impoundment effects follows.

Upstream impoundments affect water quality in a positive and negative manner due both to the characteristics of the water released and the operational method of the dams. For the area north of Montague, the net effect has been for the most part degradative while downstream more beneficial effects are realized due to the Supreme Court decision of 1954. This section will highlight some of the observed and probable effects of the three major upstream reservoirs, the Neversink, the Pepacton, and the Cannonsville impoundment.

Some background on reservoir operations is needed in order to define these effects. New York City operates these reservoirs to supply about 40 percent of its water supply (as discussed in III.A.1), to provide for conservation releases for fish and wildlife management, and to maintain the Supreme Court ordered flow of 1750 cfs at Montague. The reservoirs also release excess capacity to supplement flows at Montague between June 15 and March 15. These supplemental flow rates will be decreased as New York City water demand increases.

The City of New York has complete control over the operation of these reservoirs in order to maintain the required flow. In practice, this has allowed New York City to release primarily from Cannonsville Reservoir because of its summer eutrophic condition. Releases from the reservoir are also not discharged at constant rates. This produces a surge which has deleterious effects on downstream biota (as discussed in VI.A.6).

One might expect releases from impoundments (especially eutrophic reservoirs) to significantly degrade the water quality of the downstream reaches. The significance of the effect would depend on the location of the outlet works, the morphology of the reservoir, and the trophic state of the impoundments, among others. For example, if the outlet works for a short, deep eutrophic impoundment draw from the bottom waters, discharge water would be low in coliform organisms, pH, temperature and suspended solids, but high in CO_2 content and possibly dissolved iron and manganese. The D.O. content would depend upon the reaeration capacity of the discharge. On the other hand, water withdrawn from the top layer of such a vertically stratified lake would be higher in D.O., suspended solids, temperature and pH, but lower in CO_2 and dissolved iron and manganese.

For long, thin impoundments, such as those found in the upper Basin,

one might expect the releases to be of considerably better quality. In these cases, the upper end of the reservoir acts to trap large amounts of the inorganic and organic sediment influx. Bottom waters drawn through such dam outlet works will be higher in D.O., pH and lower in nutrients and dissolved metals than would be expected in a reservoir of more uniform shape. Significant temperature variations would still be expected though.

With regard to the New York City impoundments, only downstream temperature effects have been considered significant, which is not to say that released water has the same quality as that naturally flowing downstream. When the River Master calls for New York City releases, the high release rates of colder water (due to the bottom draw of the reservoirs) has caused substantial temperature variations downstream. During a macroinvertebrate sampling program done in 1965 and 1968 (Effects of Cannonsville and Pepacton Reservoir Releases on Aquatic Life in the Upper Delaware River, July, 1971), water temperature, as a result of reservoir releases, declined to as low as 59°F in the West Branch of the Delaware below Cannonsville and to 46°F in the East Branch of the Delaware versus a normal water temperature of 66°F. During 1966 releases from Cannonsville Reservoir, water temperatures dropped 14.5°F at a point 8.1 miles downstream and 4.5°F at a point 44.3 miles downstream. Examination of more recent USGS temperature data at downstream sampling stations confirms the above trends.

A second effect on temperature is caused by the meager flow rates accorded to fish and wildlife preservation. The existing conservation releases from the three reservoirs are as shown in Table 6-2. When the idea of conservation releases was originally developed, these low flows were only designed to indicate the minimum historical flows occurring under extreme natural conditions. Higher flow rates for fish and wildlife preservation were intended. Because New York City views these minimums as sufficient, high temperatures in water below the dam have occurred. This procedure acts to magnify the water temperature differential that typically exists below Cannonsville Reservoir between slugs of cold water releases and ambient temperature levels. Below the Pepacton and Neversink Reservoirs such temperature differentials aren't as much of a problem as the high water temperatures due to minimal releases.

Recently, the New York State Department of Environmental Conservation has suggested that conservation flows from the impoundments be increased about 3 to 5 times above summer releases and 10 to 16 times above winter releases (Proposed Alternative Releases for the New York State Reservoirs in the Upper Delaware River Basin, 1974). Adoption of this proposal would tend to reduce the observed temperature variations and decrease the high summer maximums.

Although these temperature fluctuations and extremes are obviously deleterious to the propagation and enhancement of fish and wildlife,

Table 6-2 Conservation Releases From New York City Reservoirs

RESERVOIR	CONSERVATION RELEASE	
	Range, mgd	Range, cfs
Cannonsville	5-15	7.7-23.1
Pepacton	4-12	6.2-18.5
Neversink	3-10	4.6-15.4

Source: Proposed Alternative Releases from the New York City Reservoirs in the Upper Delaware Basin, 1974.

it's apparent that the present regulatory system is unable either to devise or administer a solution to the problem. In order to affect a change, New York State, New York City, the River Master and the DRBC would have to agree to the solution. Both the DRBC and New York State would like to see the situation improved. However, it's unlikely to occur until the constraint or New York City's management of the system (that is, the eutrophic state of Cannonsville Reservoir) is removed. It's possible that the Clean Lakes Program of PL 92-500 will initiate the clean-up or that Section 208 planning will develop solutions to the problem of eutrophication in the reservoir.

As mentioned earlier, other impoundment-caused water quality changes downstream of the reservoirs have not had the adverse effects that temperature variations have had. Table 6-3 which shows summer and annual averages of certain water quality parameters both upstream and downstream of Cannonsville Reservoir, indicates the magnitude of existing water quality changes. The bacteriological quality improved while no substantial changes in D.O. levels were observed. Nutrient levels also decreased, which could indicate that a substantial amount of nutrients remain trapped in the upper reaches of the reservoir as settled inorganic particles and organic detritus.

Repulsion of the salinity gradient and low-flow augmentation have been the major positive effects of upstream impoundments. According to the DRBC, the addition of the extra upstream reservoir capacity has

Table 6-3 Water Quality Above and Below Cannonsville Reservoir

CONSTITUENT, mg/l UNLESS OTHERWISE INDICATED	SUMMER AVERAGE		ANNUAL AVERAGE	
	UPSTREAM AT WALTON	DOWNSTREAM AT STILESVILLE	UPSTREAM AT WALTON	DOWNSTREAM AT STILESVILLE
Fecal Coliform, #/100 ml	125	15	80	6.0
D.O.	9.2	9.5	11.9	10.6
BOD	0.6	0.6	1.8	1.1
Nitrogen, total as N	1.4	0.79	1.22	0.83
Phosphorus, total as P	0.14	0.02	0.07	0.03

Source: USGS, Water Quality Data, 1973-1974.

allowed the Commission to almost meet the 3,000 cfs flow objective at Trenton during a drought condition. This monthly average flow value of 3,000 cfs was chosen to protect the existing beneficial uses of water from seawater intrusion. Higher minimum flow rates also increase the waste assimilative capacity by providing more water for dilution, for higher aeration rates due to increased velocities and for faster assimilation because of the increased oxygen flow.

In summary, water temperature decreases in reaches downstream from the impoundments have been the major observed negative effect. In the lower Delaware River and estuary, greater control of downstream releases has given the DRBC the ability to reduce water quality degradation during low-flow periods and has, therefore, been beneficial.

VI.A.2 CONTIGUOUS AREAS

VI.A.2(a) Features

The contiguous area consists of five counties and three states (Pike and Monroe Counties in Pennsylvania, Sussex and Warren in New Jersey, and Orange County in New York). The northwestern portion of the contiguous area is located in the Southern Appalachian Plateau and includes the Pocono Mountains and the Stroudsburgs. The area reaches maximum elevations of approximately 2,000 feet above sea level and consists of gently rolling ridges and drainage divides. A portion of the contiguous area near the Delaware Water Gap National Recreation

Area and the New Jersey sector is characterized by parallel ridges running east to south-west. These comprise the Kittatiny Mountain Ridge of the Shawangunk Mountains.

The contiguous area contains mostly unspoiled lands in their natural state. The Pennsylvania side of the contiguous area is primarily forest land, some of which is in a climax state. The New Jersey portion varies from heavily forested land to cleared agricultural land. The Highpoint State Park and Stores State Forest are located atop the Kittatiny Ridge.

Eight major drainage basins are located in the contiguous area. The Brodhead Creek (186,970 acres), Bushkill (106,166 acres), and the Pocono Plateau (105,406 acres) represent the three largest Pennsylvania drainage basins. The Paulins Kill (112,347 acres) is the largest of the New Jersey basins and second largest overall within the contiguous area.

VI.A.2(b) Water Quality

As shown in Table 6-4, a compilation of data collected by USGS and Hydroscience for summer low-flow conditions, water quality in this area is again very good to excellent. D.O. varied from 8.2 to 8.6 mg/l, BOD ranged from 1.2 to 1.5 mg/l, and alkalinity varied from 13.0 to

Table 6-4 Delaware River Water Quality Between Port Jervis and Tocks Island Summer Mean Values (July - September)

CONSTITUENT, mg/l UNLESS OTHERWISE INDICATED	PORT JERVIS	DINGMANS FERRY[b]	DELAWARE WATER GAP[b]
D.O.	8.6	8.2	8.2
pH	7.1	7.1	7.3
BOD_5	1.2	1.2	1.5
COD	6.0	-	-
Temperature, °C	19.0	21.0	21.0
Nitrogen, Total as N	0.54	.54	.48
Phosphorous, Total as P	0.017	0.02	0.03
Fecal Califorms #/100 ml	40.0	50.0	108
Alkalinity, Total as $CaCO_3$	13.0	15.2	17.0
Hardness, Total as $CaCO_3$	23.0[a]	-	-
Suspended solids	3.0	2.0	6.0

Source: USGS and Hydroscience, 1973-1974

a. USGS data only
b. Hydroscience only

17.0 mg/l during the sampling period.

Although the frequency of data collection is not adequate to determine compliance with all DRBC water quality objectives, the monthly data indicate that all water quality objectives are being met. Diurnal variations developed from data collected by Hydroscience are not great, as D.O. varied from 7.1 to 9.4 mg/l and pH from 6.3 to 7.6. Because of low alkalinity though, significant photosynthetic activity could increase pH values sharply.

VI.A.3 LOWER REACH AND ESTUARY

VI.A.3(a) Features

The downstream reach of the basin includes the Lehigh River and Schuylkill River tributaries. Major cities include Weissport, Allentown, and Bethlehem on the Lehigh River and Reading, Pottsville, and Philadelphia and its suburbs on the Schuylkill River. The Lehigh and the Schuylkill drain large areas of agricultural land. Both rivers are heavily influenced by industrial dischargers.

Moving south on the mainsteam, Trenton is the first large city encountered. The city of Trenton and lands directly south contribute to industrial point-source discharges. Philadelphia and Camden add to the point-source discharge to the point of creating a prominent "D.O. sag"

(see VI.A.7). Wilmington, Delaware and Bridgetown, New Jersey add to the point-source discharges in the estuary/bay area.

VI.A.3(b) Water Quality

Water quality in the nontidal downstream reach between East Stroudsburg and Trenton is general'y good. As shown in Table 6-5 which lists the water quality as defined by summer averages of data collected by Hydroscience and USGS, most water quality objectives are met, although the observed mean value for fecal coliform concentrations is greater than the objective of 200 mg/l. Comparisons between DRBC Zones 1D and 1E (ID is the upper section of the downstream reach) indicate a general reduction in water quality as BOD and alkalinity increased from 1.8 and 30.1 mg/l to 2.4 and 49.5 mg/l respectively.

The tidal portion of the River between Trenton and Liston Point has the worst water quality of any of the sections previously characterized. Included in this section are DRBC Zones 2-5. As shown in Table 6-6 average summer low-flow D.O. varies from 1.6 to 8.9 mg/l, pH varies from 6.8 to 7.5 mg/l, Cl from 17 to 633 mg/l and hardness from 62 to 220 mg/l. Differences in Cl, because of varying tidal influence in each reach, are reflected in the data as are the hardness variations. Fecal coliform counts, of particular importance to recreational use and the contamination of shellfish beds, ranged from 55 to 4230 per 100 ml, compared with the fecal coliform water quality objective of 770 per 100 ml.

Table 6-5 Water Quality Characteristics in the Delaware Between Tocks Island and Trenton

CONSTITUENTS, mg/l unless otherwise indicated	ZONE ID Between Tocks Island and Easton	ZONE 1E Between Easton and Trenton
BOD	1.8	2.4
D.O.	7.6	7.6
pH	7.4	7.7
Temperature, ^{o}C	22.0	21.0
Nitrogen, Total as N	0.92	1.65
Phosphorus, Total as P	0.04	.10
Cl	8.6	11.6
Fecal Coliforms #/100ml	300	319
Alkalinity	30.1	49.5
Hardness	-	-
Suspended Solids	8	10.0

Source: Hydroscience and USGS, 1973-1974.

Table 6-6 Water Quality Characteristics in the Delaware Estuary

CONSTITUENTS, mg/l UNLESS OTHERWISE INDICATED	ZONE 2 AT FLORENCE, NEW JERSEY	ZONE 3 AT PHILADELPHIA NORTHEAST SEWAGE PLANT	ZONE 4 AT PAULSBORO	ZONE 5 AT NEW CASTLE
BOD	3.2	4.4	6.1	3.0
D.O.	8.9	4.6	1.6	2.9
pH	7.5	7.3	7.0	6.8
Temp °C	24.5	25.4	25.0	24.5
Nitrogen, *Total as N*	2.2	3.1	4.7	4.6
Phosphorus, *Total as P*	.31	0.35	.26	0.26
Cl	17	22	36	633
Fecal Coliforms #/100ml	55	3838	4230	756
Alkalinity, total as $CaCO_3$	36	36	35	22
Hardness, total as $CaCO_3$	68	62	90	220
Turbidity mg/l SiO_2	16.50	16	12	24

Source: USGS, Water quality data, 1969-1970.

Because the D.O. sag is of such importance to the fishery resource, its location, duration, and magnitude are fully discussed in VI.A.6 (a). Observed D.O. values are directly related to stream flow. Increased flow at Trenton significantly shifts the location and magnitude of the dissolved oxygen profile. Another effect of flow is through tide stage. Investigations of tide stage versus dissolved oxygen concentration within the estuary indicate that the D.O. sag is not stationary, but moves up and down the river with the tide. In addition, within a 24 hour period, any sampling station in the estuary may be subjected to a wide rage of dissolved oxygen concentrations.

Because of the heavily industrialized and developed nature of the area, heavy metal concentrations are increasing. Table 6-7 lists the concentrations of heavy metals in water samples taken along the Delaware estuary. Heavy metal contributions to the estuary come from both municipal and industrial effluents and both combined and separate stormwater overflows. An EPA-sponsored study completed by URS Research Company substantiated this conclusion by measuring the concentration of heavy metals in urban runoff from representative cities around the U.S.A. In addition to heavy metals, stormwater runoff, especially combined runoff, exerts a significant D.O. demand on the receiving waters. This observation has been validated in the

Table 6-7 Range of Maximum Concentrations of Heavy Metals, Delaware Estuary, 1967 to 1972

Metal		Range of max. conc. from 1967-1972 (mg/l)
1.	Zinc	0.110 to 1.13
2.	Iron	1.38 to 18.30
3.	Nickel	0 to 0.3
4.	Cadmium	0.002 to 0.050
5.	Copper	0.02 to 0.4
6.	Chromium	0.02 to 0.3
7.	Manganese	0.18 to 2.72
8.	Lead	0.02 to 0.46
9.	Aluminum	0.28 to 3.50
10.	Mercury	0.0006 to 0.100

Source: "An Historical Look at the Water Quality of the Delaware River Estuary to 1973," ANSP, 1974.

Philadelphia area where it was shown that the D.O. sag caused by storm water runoff can have a significant effect on downstream D.O. values. In this particular case, the D.O. sag reached its lowest value after 6 days.

The water quality of the bay from Liston Point to the sea at Capes May and Henlopen is primarily determined by intruding seawater. Dissolved oxygen values are usually near saturation levels, as pollution loadings, in terms of oxygen-demanding materials, are largely dissipated before reaching the bay. However, the high concentrations of coliform bacteria sometimes found in the area have closed beaches and contaminated shellfish seed beds.

VI.A.4 WATER QUALITY MODELS

Mathematical water quality models exist for many sections of the Delaware River and estuary. Because of the heavily urbanized and developed nature of the estuary area, most models have dealt with these segments. Their prime function has been to guide the allocation of present and future waste discharges so that water quality objectives can be met.

VI.A.4(a) Background

Some important characteristics of models should be reviewed before

a description of their results can be presented. These include the temporal and spatial variability considered by the models, the verification and calibration of the model and the water quality information being predicted.

Because of the temporal variability inherent in the flow regime of the Delaware, in the municipal and industrial effluent discharges into the river and estuary, and in the diurnal nature of photosynthetic activity, model treatment of time variations is extremely important. Steady-state models assume all variables are independent of time, that is, they assume constant flow conditions for the Delaware and its waste dischargers. Photosynthetic activity is also assumed to occur at a constant rate. Some of the models even treat urban stormwater runoff and combined sewer overflows (now determined to be a major source of stream quality degradation) as a constant input, even though such effluent is produced only during stoichastic precipitation events. In terms of spatial treatment, most models are one-dimensional, that is, they consider the effluent to be completely mixed across the horizontal and vertical axes of the stream. Variations along the longitudinal axis of the stream are usually the only spatial variability assumed.

Model testing and verification is necessary to determine the model's ability to characterize existing water quality. These deterministic models contain many rate coefficients whose effect upon the result is

extremely important. In the verification process, the effect of these variables may be determined and refinements subsequently made in their value so that the model will accurately describe existing and predict future conditions under a similar range of river flows.

Once the models have been tested and verified, projections of future water quality can be made by inputting different waste management schemes. As mentioned initially, the ultimate capacity of the receiving stream to accept certain types of pollution can also be determined so that waste dischargers to a particular reach of the river can be allocated fair and equitable portions of the stream's assimilative capacity. The above process is important because it is the process by which the DRBC determines the levels of treatment (above secondary treatment) to be provided by waste dischargers.

VI.A.4(b) Models

The only model developed at present for the Delaware River in the Upper Basin was prepared by Hydroscience. This steady-state model can determine BOD and D.O. levels in the West Branch of the Delaware above Cannonsville Reservoir under constant river and waste flow conditions. No provisions for non-point source additions were included in the model. Calibration and verification of the model produced results very similar to those observed in the concurrent water quality monitoring study. Operations of the model showed that

a D.O. sag will occur below both the Village of Stamford and Walton sewage treatment plants under low flow conditions. Diurnal D.O. measurements and an approximate accounting of nitrogen and phosphorus inputs indicate that diurnal variations now occurring are primarily related to nutrients from non-point sources.

In the remaining segments of the basin, many models have been developed for allocation of BOD, for salinity gradient movement and for D.O. variations. Table 6-8 lists the models with their developers, users and areas covered. Table 6-9 shows some of the operational parameters that characterize the respective models. The following discussion will highlight the major results of the modeling efforts applied to the Delaware River and estuary.

In the Hydroscience effort, the time-varying WASP model showed that water quality problems in the upper Delaware are due primarily to non-point sources, as it is suggested that further point-source control will have little effect. Minimum D.O. violations will probably occur during the summer months due to plant biomass and not waste discharges. Operation of the WASP model by Hydroscience indicated the utility of time-varying formulations to predict maximum diurnal D.O. fluctuations and the importance of rooted aquatic macrophytes in influencing diurnal D.O. variations and affecting downstream D.O. consumption.

Table 6-8 Water Quality Models for the Delaware River and Estuary

MODEL	DEVELOPER	USER	AREA COVERED
DECS		DRBC	Delaware Estuary
STREM	Hydroscience	DRBC	Delaware River, Easton to Trenton
WASP	Hydroscience	DRBC	Delaware River, Tocks Island to Trenton
Salinity	United Engineers	Power Companies URS	Delaware Estuary
Statistical Salinity[a]	URS	URS	Delaware Estuary
DECS III	General Electric	DRBC	Delaware Estuary
NGEN	Hydroscience	DRBC	Delaware Estuary

Source: Betz Engineers, 1975

[a] URS/Madigan-Praeger 1975

Table 6-9 Summary Information For Water Quality Models

MODEL	SYSTEM TYPE	INPUT DATA CAPACITY	OUTPUT SIMULATION	DIMENSIONS	VERIFICATION	STATUS
DECS	Steady-state	Flow,DO,CBOD,NOD rate coefficients	DO	one	Summer 1964 & 1968	Operational
DECS III	Partial Time-varying	Flow,DO,BOD,Cl, alk pH, rate coefficients	DO,Salinity, alk pH	one	DO not completely verified	Operational
STREM	Steady-state	Flow,DO,T,CBOD,NOD photosynthetic component,rate coefficients	DO,CBOD,NOD	one	Aug. & Sept. 1970	Operational
WASP	Partial Time-varying		Hourly DO,nutients, Chlorphyll-a	one	June-Aug., 1973	Operational
NCEN	Steady-state	Flow,BOD,T,rate coefficients	DO	two	July-Aug.1964 Nov. 1967	Operational
Salinity intrusion	Time-varying	Flow, Cl	Cl	one	June-Dec.1964 Aug.-Oct.1967	Operational
Statistical Salinity[a]	Stochastic	Flow, Cl	Cl	-	Feb. 1975	Operational

Source: Betz Engineers 1975
[a]URS/Madigan Praeger 1975

Specific conclusions of the study include: (1) the water quality management problems of the non-tidal reach above Trenton are primarily related to non-point source discharges; (2) violations of the DRBC minimum dissolved oxygen level of 4.0 mg/l will occur due to photosynthetic activity if higher levels of nutrient input and resulting aquatic plant growth continue; (3) increased plant biomass as a result of nutrient loads is directly responsible for observed D.O. variations; (4) major nutrient sources in the area are from tributaries and not waste treatment plants located along the Delaware River; (5) rooted aquatic plants are the major plant species; (6) the observed D.O. sag at Bristol is at least partly due to the BOD, NOD and organic detritus contributed by Zone 1; organic particle settling followed by benthic oxygen demand exertion has been suggested as the prime factor; (7) water quality projections by the model indicate that increased wastewater loadings will increase the magnitude of the D.O.sag and the growth of aquatic plants. The effect of non-point nutrient sources on plant growth and resulting oxygen respiration will still predominate though.

Development and application of STREM, the steady-state model for the Delaware between Easton and Trenton, yielded results complimentary to those developed in the WASP analysis. These results showed that: (1) municipal and industrial dischargers contribute little to the observed D.O. decreases, but that increases in their organic and

nutrient output will undoubtedly lead to degradatory conditions; (2) observed diurnal variations in D.O. are primarily caused by the respiratory activity of attached and rooted aquatic plants and free-floating phytoplankton; (3) nutrient levels in the area are fairly high and contribute to diurnal D.O. variations through aquatic plant growth; (4) carbonaceous and nitrogenous material from the upper Delaware and Lehigh Rivers create the most significant oxygen demand on the River; (5) water quality objectives within the area will be maintained in spite of increased effluent discharges, although the effects of the growth and activity of aquatic plants is not presently known and could substantially change this projection.

The DECS modeling effort was one of the first modeling efforts designed to give decision-makers well-quantified choices on water quality management plans. This model predicted it was possible to maintain various D.O. levels with different treatment levels, thus indicating that point source discharges were the primary cause for low observed D.O.'s. As will all steady-state models, the results are open to question due to their handling of highly time variable parameters. This model also treated combined storm sewer overflows as a constant source and apparently assumed an improper rate coefficient for nitrogenous demand. Other important considerations the model does not deal with are conservative pollutants, the effects of algae, zooplankton, benthic organisms and fish, and sediment oxygen demand.

The DECS model was reevaluated and modified in 1973 by EPA to more closely simulate natural conditions by changing the nitrogenous oxygen demand computation. Results from the study indicated that nitrogenous oxygen demand was significant and recommended more complete study before specific actions are taken. To maintain D.O. levels at present standards, the study indicated that 95 percent removal of carbonaceous oxygen demanding waste and 50 percent removal of nitrogenous oxygen demand is necessary. Furthermore it showed that even 100 percent carbonaceous oxygen demand and 85 percent nitrogenous oxygen demand removal could not guarantee maintenance of the Interior Department Committee's 4.0 mg/l D.O. standard. Finally the importance of stormwater, benthic and tributary pollutant waste loads at high levels of waste treatment was examined. A discussion of the remaining salinity models, the United Engineer's, the URS statistical, and the DECS III, is contained in Chapter IX.H. Chapter IX.H also discusses the application of a modified DECS model to describe salinity changes as a function Delaware River and outflow, while Chapter IX.B delineates the effects of Delaware River outflow variation on D.O. concentrations in the estuary through the application of the DECS program.

VI.A.5 DELAWARE RIVER WATER QUALITY MANAGEMENT

On October 27, 1961, the states of Delaware, New Jersey, New York and the Commonwealth of Pennsylvania, and the United States of America enacted, through the Congress of the United States, the Act entitled "The Delaware River Basin Compact." The five signatory parties, having sovereign right and responsibility of the water resources of the basin, formed the Delaware River Basin Commission to provide a single administrative agency to properly plan and utilize the water resources of the Delaware River Basin to meet present and projected demands, remove controversy over the interdependent uses of the basin, provide interstate cooperative planning, and "to apply the principle of equal and uniform treatment to all water users who are similarly situated and to all users of related facilities, without regard to established political boundaries."

It is the job of the Delaware River Basin Commission to encourage uniform planning and development of the basin resources. The Commission has the power to develop and effectuate plans and is required to formulate and adopt a "Comprehensive Plan" presenting the quantity and quality of water resource needs of the basin.

Development of the Comprehensive Plan is a continuing process. The Commission may adopt or modify portions of the Comprehensive Plan as deemed necessary to promote the broad objectives of the Compact, which

include the maintenance of water quality adequate for beneficial purposes. The Comprehensive Plan serves not only as a general guide for development of the water resources, but also as a regulatory document to prohibit development that does not conform to the Plan. In this respect, it is a codification of administrative laws adopted by an administrative agency, and as such, its various parts are each subjected to careful and extensive study before adoption. The Plan continues to grow in scope as the Commission, almost monthly, adds new projects, policies, criteria, and standards.

Included within the general powers of the Delaware River Basin Commission is the establishment of planning, design and operation standards for all project facilities within the basin affecting water quality. The Commission may conduct, or sponsor, the research of water resources within the basin, and interpret data from the research to properly manage the basin resources. The Commission is charged to review all projects having substantial effect on the water resources of the basin, and reject those projects which would substantially impair or conflict with the Comprehensive Plan of the Commission.

The Delaware River Basin Commission has the power to regulate the flows and supplies of surface and ground waters in the basin for stream quality control. This includes the power to acquire, operate and control the facilities utilized for the storage of basin waters.

In order to avoid conflicts of jurisdiction between federal, state and local agencies proposing projects in the basin and the Delaware River Basin Commission, all projects shall be undertaken in consultation with the Commission and all projects shall first have been included by the Commission in the comprehensive plan. The DRBC's review of wastewater systems , as well as other projects affecting the water resources of the Basin, is mandated by Section 3.8 of the Compact, which states, in part, that:

> "No project having a substantial effect on the water resources of the basin shall hereafter be undertaken by any person, corporation or governmental authority unless it shall have been first submitted to and approved by the Commission..... The Commission shall approve a project whenever it finds and determines that such project would not substantially impair or conflict with the Comprehensive Plan and (the Commission) may modify and approve as modified , or may disapprove any such project whenever it finds and determines that the project would substantially impair or conflict with the comprehensive plan... Any determination of the commission hereunder shall be subject to judicial review in any court of competent jursidiction."

VI.A.5(a) Technical Planning Assumptions

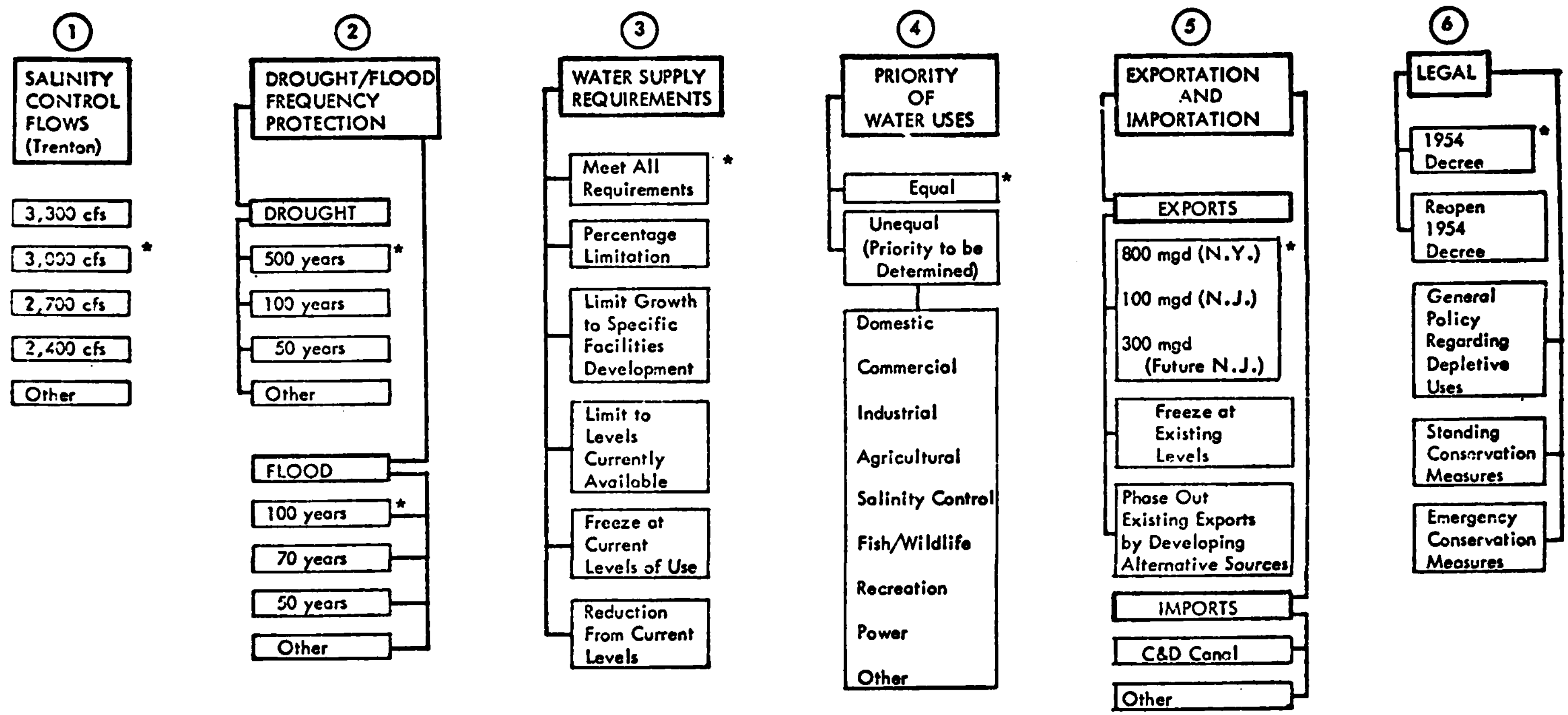
The primary Delaware River Basin water resources policy issues may be considered within the following six areas: (1) salinity control flows at Trenton; (2) drought or flood frequency protection; (3) water supply requirements; (4) priority of water uses; (5) exportation and importation of water and (6) legal implications. These issues may overlap or interact. A change in one assumption may affect the planning and implementation of the other. The range of policy issues and associated technical planning assumptions under continuing evaluation by the Delaware River Basin Commission are presented in Figure 6-2.

VI.A.5(b) Constraints Upon Management

The Delaware River Basin Commission Comprehensive Plan was initiated in 1962 and is frequently updated to maintain its applicability to present situations. Since the Comprehensive Plan was first adopted, a number of Federal acts have been implemented. These include the Water Resources Planning Act of 1965, the National Environmental Policy Act of 1969, and the Federal Water Pollution Control Act of 1972. The DRBC has not, as yet, reevaluated all the basic policy issues to be found within Phase I of its Comprehensive Plan. Therefore, some of the DRBC policies are not directly in synchronization with some of the later Federal laws.

In October 1973, the Water Resources Council (WRC), issued its "Principles and Standards" which establish planning methodology and Federal participation in water resources planning. Three planning levels are included within the Principles and Standards. The first Level A, consists of framework studies of the major regions. The second, Level B, includes regional and river basin plans. The DRBC has indicated its intention of carrying out a Level B study, and its application has been assigned a high priority among those submitted to the WRC. Upon completion of the Level B study, the DRBC Comprehensive Plan may be amended accordingly. The third level of WRC planning is project feasibility studies. The DRBC Comprehensive Plan conforms in various aspects to this planning level which includes authorization and implementation of specific programs or

POLICY ISSUES AND ASSOCIATED ALTERNATIVE PLANNING ASSUMPTIONS



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*Current Planning Assumption

Source: Delaware River Basin Commission Staff Paper

projects resulting from the framework studies and river basin plans.

One problem is the uncoordinated evolution of planning assumptions due to the varying needs of the signatory parties. The demands of the signatory states will naturally change as a function of time. This is due to increased urbanization (i.e., water supply), demand for recreation, and the upgrading of water quality criteria by both state and federal governments. These variations have produced policy inconsistencies which may act as planning constraints.

An example of conflicting needs can be seen in relation to the water supply exports to New York City and the need for flows to control salinity gradient intrusion in the lower reaches of the Delaware River estuary. In 1954 the U. S. Supreme Court required New York City to augment the low flows of the Delaware River as compensation for storing water from high flows and diverting up to 800 million gallons out of the Delaware River basin. The 1954 decree established a minimum flow of 1,750 cfs at the Montague, New Jersey, gauging station. The Compact specifically prohibits the Commission from changing the diversion rights on downflow requirements of the 1954 Supreme Court decree. However, the Commission may act to temporarily modify flow requirements during time of a drought or catastrophe. This may be done only after unanimous consent of Commission members.

The Commission has assumed the responsibility for reimbursing the Federal Government for costs of water-supply storage in multi-purpose reservoirs constructed by the Federal Government in the Delaware River Basin. Parties using waters from these reservoirs are required to pay uniform rates for the water, thereby sharing in the costs. In this way, the Commission can repay the cost of providing the water-storage facilities. This procedure evolved from the flow restraints placed by the 1954 Supreme Court Decree.

VI.A.6 DELAWARE RIVER FISHERIES RESOURCE OVERVIEW

Values of the physical and chemical parameters (i.e., salinity, temperature, dissolved oxygen) which characterize the Delaware River system range widely depending upon location. The aquatic biota of the river and estuary are correspondlingly diverse, and throughout most of the Delaware Basin waters, extremely productive. As a result, abrupt and marked changes from ambient conditions, whether they are due to unexpected natural shifts or introduced stress factors, can impart considerable damage to the fisheries resource and limit its productivity.

VI.A.6(a) Problem Areas

The most significant problem area on the Delaware River is the D.O. block in the estuarine region near Philadelphia (VI.A.3(b). The continued survival of the anadromous fish attempting to pass through this region to spawn in swift, high quality waters upstream, or to move cut

to sea, is jeopardized by this D.O. sag.

Due to its commercial and game fish value, the American Shad has received the most attention in relation to the dissolved oxygen quality of the river.

Lethal values of D.O. range from 2.0 to 4.0 mg/l, depending on the length of exposure and age of the shad. As shown in Table 6-10, minimum D.O. levels during summer low-flow periods consistently drop below these figures. Even the maximum values for summer conditions at Paulsboro and Cherry Island fall within the lethal range. Whereas lethal effects of low dissolved oxygen are readily apparent, the sub-lethal effects (e.g., rapid gulping or refusal to eat) may act to weaken or elevate the oxygen requirement of the fish leading to eventual mortality. Most of the values in Table 6-10 could be considered as directly (lethal) or indirectly (sub-lethal or preventing successful spawning) damaging to the shad moving through this area during the summer. Though it should be recognized that these values represent selected sample sites and not a homogeneous block, the measurements in the middle of the channel and at a depth of 3 feet probably reflect better than average conditions.

As discussed in IX.C.2, successful spawning and recruitment of the American shad is largely determined by the relationship of the formation and eventual dissipation of the pollution block to the

Table 6-10 D.O. Variations At Selected Estuarine Locations During Summer Low Flow Periods

	Burlington-Bristol Bridge	Philadelphia Northeast Sewage Treatment Plant	Paulsboro	Cherry Island
1970	6.0			
Max.	6.0	4.6	2.8	4.7
Mean	4.5	2.5	1.5	2.2
Min.	3.6	0.7	0.5	0.7
1969				
Max.	7.1	6.4	2.8	3.2
Mean	5.1	3.7	1.8	1.8
Min.	3.8	1.4	0.9	0.0
1968				
Max.	7.1	6.1	1.9	5.1
Mean	5.4	3.3	1.2	2.1
Min.	3.0	0.4	0.6	1.0
1967				
Max.	6.8	4.8	3.1	4.3
Mean	5.5	3.3	1.8	2.1
Min.	4.3	1.3	1.0	1.0

Source: Water Quality of the Delaware River Estuary 1967-1970, U.S. Geological Survey.

temperature and flow cues for juvenile and adult migration. The adult shad moving upstream in the early spring and the juveniles moving downstream in the late fall avoid the most severe period of the pollution block. Those fish that do attempt passage through the sag during low-flow conditions, however, suffer severe losses. Approximately 40 to 80 percent of the entire shad run has been unable to penetrate the pollution black and migrate upriver (Massmann, 71). Data collected in the last few years, though inconclusive due to high-flow conditions, suggest that the D.O. sag has been shorter in duration and of lesser magnitude. This possibly has allowed a greater percentage of shad to pass upstream. A marked reduction in shad usage of the Brandywine River, an alternative route for those fish blocked below Philadelphia, may support this contention but the reduction could also be related to habitat problems on the Brandywine itself.

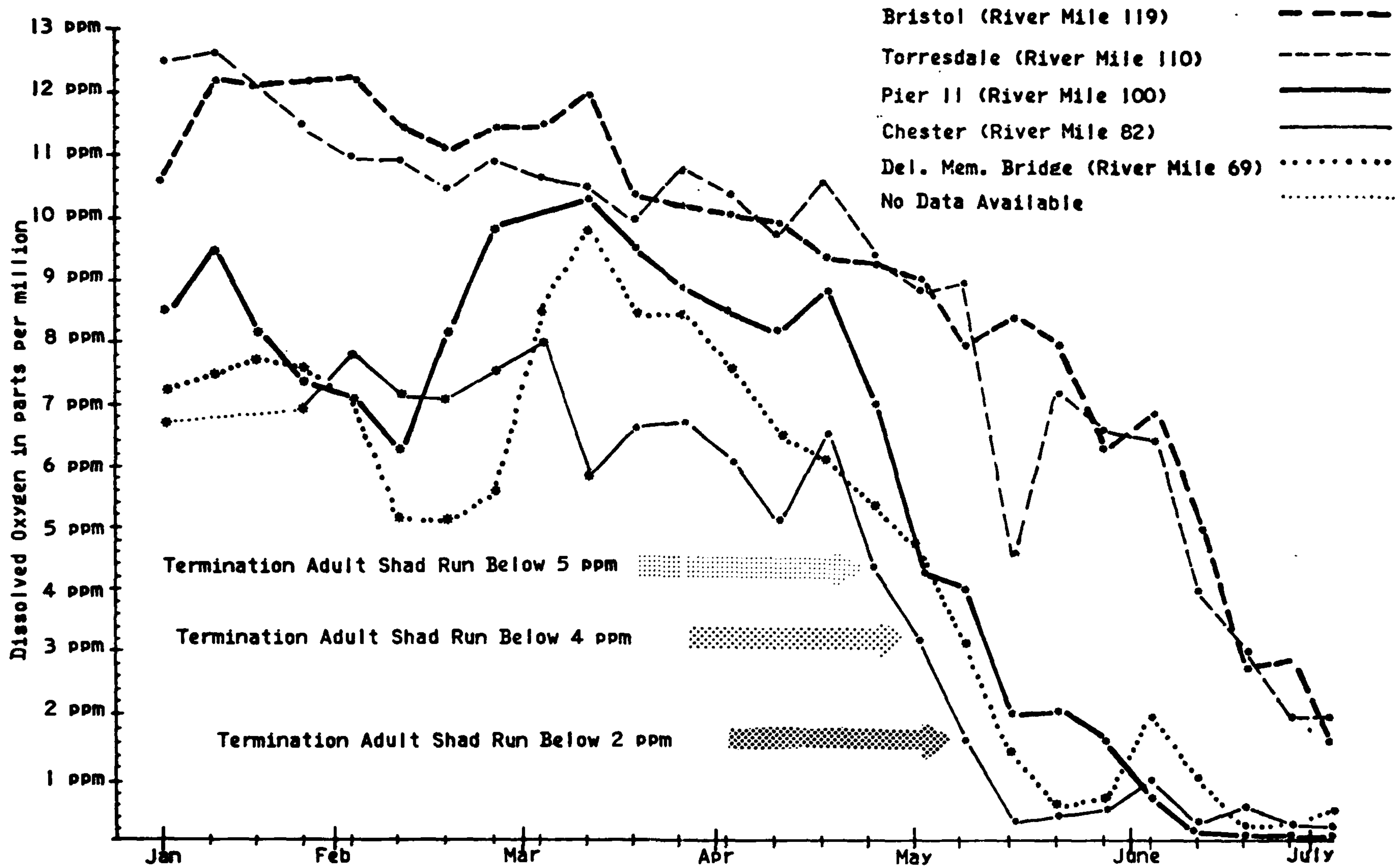
Especially hard hit are the "spent" adult shad attempting to return to the sea in late July and August. Consequently, a negligible amount of repeat spawning occurs in Delaware waters. In addition, decreasing temperatures upstream can stimulate juvenile migration downstream before the D.O. sag dissipates. A significant year-class loss results. Figures 6-3 and 6-4 illustrate the magnitude and persistence of the oxygen sag. Taking the 5.0 mg/1 level as the limit of possible sublethal and lethal effects, the spawning run through the Chester region was effectively terminated in late April and seaward migration was prevented until early December. The length of any specific dissolved oxygen sag in 1971 can be similarly determined.

Naturally, the actual impact of the sag on fish is directly related to the real levels of sublethality and lethality that exist.

Lack of conclusive data, especially with respect to juvenile shad, hinders establishment of these precise levels and the assessment of the block's effect upon the Delaware's shad population.

The 40 to 50 miles stretch of badly polluted water in the Philadelphia vicinity not only limits passage of the shad, but it curtails the use of spawning grounds above Philadelphia by striped bass. Similarly, oxygen deficient waters, which intermittently occur throughout the Delaware basin, eliminate these reaches as suitable habitat for resident as well as migratory fish species.

The river fishes migrating through or resident in the upper basin may be confronted with a different type of problem. Abrupt and severe water temperature fluctuations can destroy most or all of the established populations. Upon release, bottom waters from upper basin reservoirs have lowered water temperatures 10° to 15° F below ambient conditions downstream. The problem is compounded when low stream flows correspond to heat waves and force temperatures to soar above optimum ranges for many of the resident fish, such as the rainbow trout and smallmouth bass. Thus, the water temperature differential that exists between the river and cold water releases is inflated. Large cold-water discharges may affect the aquatic environment as far as 70

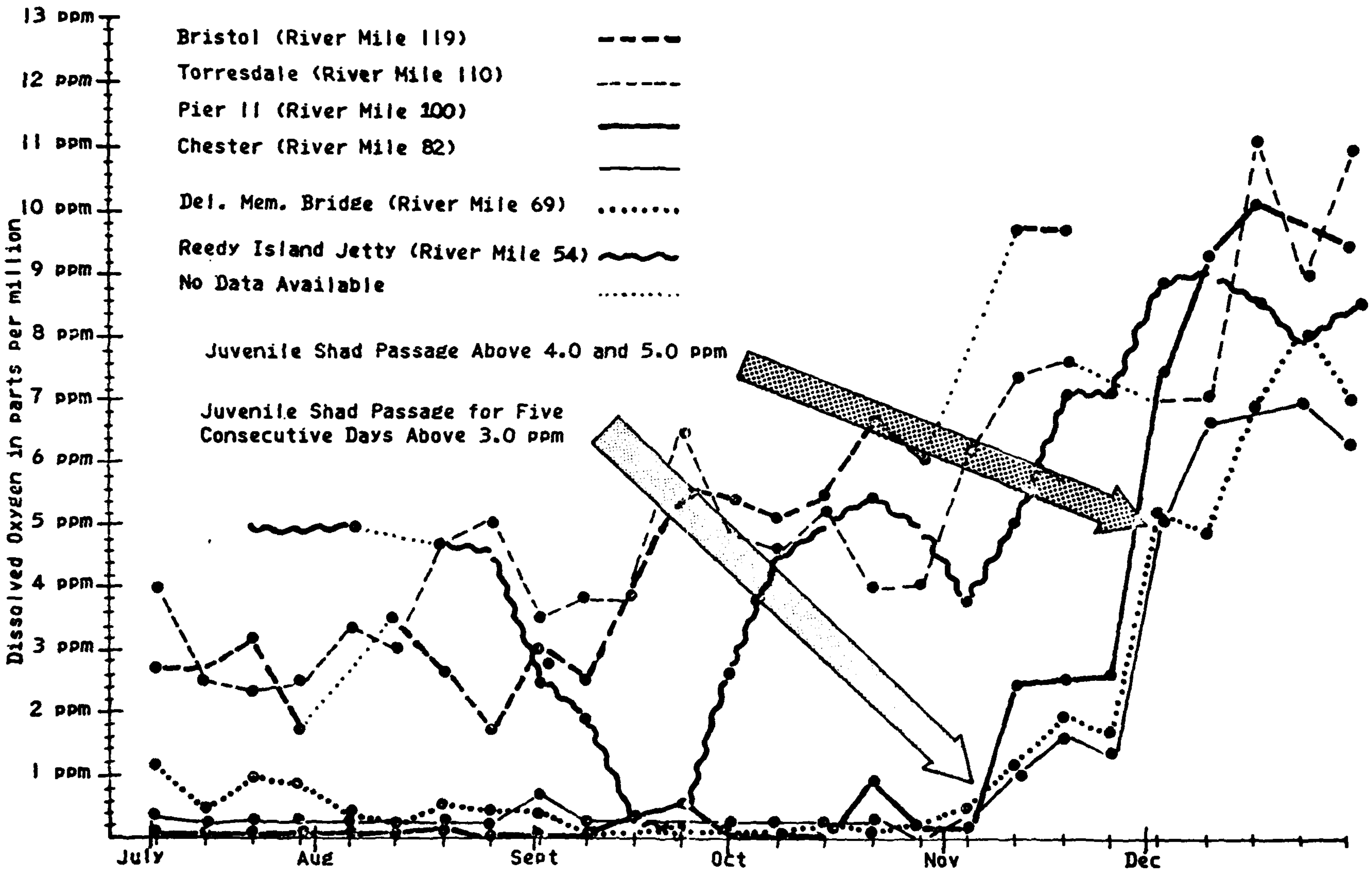


3≤

Graph line points represent Lowest D.O. reading recorded in 7 day period.

Source: Annual Progress Report - Delaware River Anadromous Fish Project 7/71 to 6/72.

MINIMUM DISSOLVED OXYGEN VALUES, LOWER DELAWARE RIVER
January - June, 1971.



Graph line points represent lowest D.O. reading recorded in 7 day period.

Source: Annual Progress Report: Delaware River Anadromous Fish Project 7/71 to 6/72

MINIMUM DISSOLVED OXYGEN VALUES, LOWER DELAWARE RIVER
July - December, 1971

miles downstream. A difference of 25° between the East Branch and the West Branch, where water was flowing from Cannonsville dam, has been observed. Thermal shock impacts vary with fish species as well as with acclimation temperatures but a temperature differential of this magnitude can be fatal to fish acclimated to the natural temperature regime. The general instability of temperature and flow in the upper basin, especially in the West Branch below Cannonsville Dam, tends to simplify the natural ecosystem of these waters and hinder the establishment of a productive game fishery or an aquatic environment with an adequate invertebrate population to support a game fishery.

Associated with the urban and industrial centers which characterize the lower reaches of the river is the influx of industrial wastes and heavy metals. Occasional loss into the river of hazardous materials (i.e., halogenated hydrocarbons or acid) transported by water carriers on the Delaware River system and the loss of oil, either during transport, unloading, or piping, adds to the toxic load of the river. Any of these substances in highly concentrated quantities are lethal to most aquatic organisms. For this reason, many industries discharging into the mainstream or tributaries of the Delaware River have damaged or may damage fish and invertebrate populations.

Table 6-11, describing all major fish kills in the Delaware River Basin, emphasizes the potential and real danger of industrial wastes to the fish resource. Chemical, metal, and food industrial wastes are the

major sources of contamination. Sewage and power plant effluent have caused large kills as well. Only kills regarded as 'heavy' by the fish kill summaries are incorporated in Table 6-11. Apparently the definition of a 'heavy' kill is based upon both the estimated number of fish killed and the estimated proportion of game fish effected.

Sources of pollution in Table 6-11 were only identified when the cause was direct. Destruction of a particular food source which may ultimately limit fish populations, disruptions in food web relationships, or cumulative effects of toxins are not considered in the determination of pollution-related fish kills. Similarly, secondary pollutional effects, such as flavor-or-odor-causing loss to commercial fisheries, are not assessed. Thus, while the fish kill information supplied in Table 6-11 is useful in locating specific point sources requiring effluent control, the more subtle effects of industrial waste discharge and non-point source pollution are masked by a lack of more detailed measurement and analysis techniques.

Because the Delaware Bay acts as an eventual sink for those heavy metals, hazardous materials, and industrial wastes not incorporated into the bottom sediment upstream, shellfish are especially susceptible to these wastes due to their ability to concentrate suspended and dissolved materials and incorporate them into their body tissue.

Table 6-11 Major Fish Kills in the Delaware Basin

Date	Location	Extent	Probable Cause	Estimated Number Killed	% Relative Loss Game	Forage
1962						
1/20/62	Delaware River near Evarnna, Pa.	3 miles, 3 days	Industrial Wastes	16,876	60%	40%
2/4/62	Delaware River near Lumberville, Pa.	65 miles, 3 days	Industrial Wastes	76,626	20%	80%
6/1/62	Delaware River near Burlington, N.J.	15 miles, 5 days	Unknown cause	4,000	10%	90%
6/7/62	Delaware River near New Castle, Del.	----------------	Unknown cause	-----	40%	60%
8/28/62	Delaware River near Easton, Pa.	----------------	Unknown cause	8,100	---	---
9/8/62	Lackawanna River near Simpson, Pa.	3 miles, 7 days	Industrial Wastes	70,262	20%	80%
9/13/62	Lehigh River near Bethlehem, Pa.	1 mile, 3 days	Industrial Wastes	16,000	60%	40%
1963	No data available					
1964						
3/24/64	Lehigh River near Bethlehem, Pa.	2 miles, 4 days	Chemical Industrial Wastes	2,000	40%	60%
5/31/64	Delaware River near Eddy, Pa.	10 miles, 3 days	Unknown cause	-----	50%	50%
7/22/64	W. Branch Delaware River near Walton, N.Y	3 miles	Food Industrial Wastes	7,500	2%	98%
8/--/64	Schuylkill River near Conshohocken, Pa.	4 miles, 3 days	Unknown Cause	1,000	40%	60%
10/18/64	Lehigh River near Palmerton, Pa.	21 miles, 8 days	Metal Industrial Wastes	29,756	25%	75%
1965						
5/18/65	Delaware River near Philadelphia, Pa.	3 miles, 1 day	Unknown Cause	------	30%	70%
1966						
4/16/66	Delaware Bay near Little Creek, Del.	8 miles, 1 day	Combined Industrial Wastes	------	---	100%
5/24/66	Delaware River near Paulsboro, Pa.	1 mile				
5/24/66	Delaware River near Paulsboro, Pa.	1 mile	Unknown Cause	2,000	---	100%
8/30/66	Delaware River near Gibbstown, N.J.	1 mile, 2 days	Chemical Industrial Wastes	-----	60%	40%
9/2/66	Schuylkill River near Philadelphia, Pa.	3 miles, 7 days	Power Plant Effluent	50,000	25%	75%
1967						
10/5/67	Schuylkill River near Conshohocken	4 miles, 3 days	Metal Industrial Wastes	25,000	95%	5%
1968						
6/11/68	E. Branch Brandywine River near Cupola, Pa.	3 miles, 1 day	Metal Industrial Wastes	5,000	70%	30%
6/22/68	E. Branch Brandywine River near Cupola, Pa.	5 miles, 1 day	Metal Industrial Wastes	5,100	70%	30%
1969						
8/31/69	W. Branch Delaware River near Walton, N.Y.	4 miles, 4 days	Food Industrial Wastes	20,000	—	—
1970	No major kills reported in Delaware Basin					
1971	No major kills reported in Delaware Basin					
1972						
7/30/72	W. Branch Little Bushkill near Wind Gap, Wind Gap, Pa.	2 miles, 3 days	Severage	7,262	50%	50%
8/23/72	W. Branch Delaware River near Walton, N.Y.	5 miles, 1 day	Food Industrial Waste	10,000	1%	99%

Source: "Pollution-caused Fish Kills," U.S. Department of Health, Education and Welfare, 1962-1970, and "Fish Kills Caused by Pollution," Environmental Protection Agency, 1970-1972.

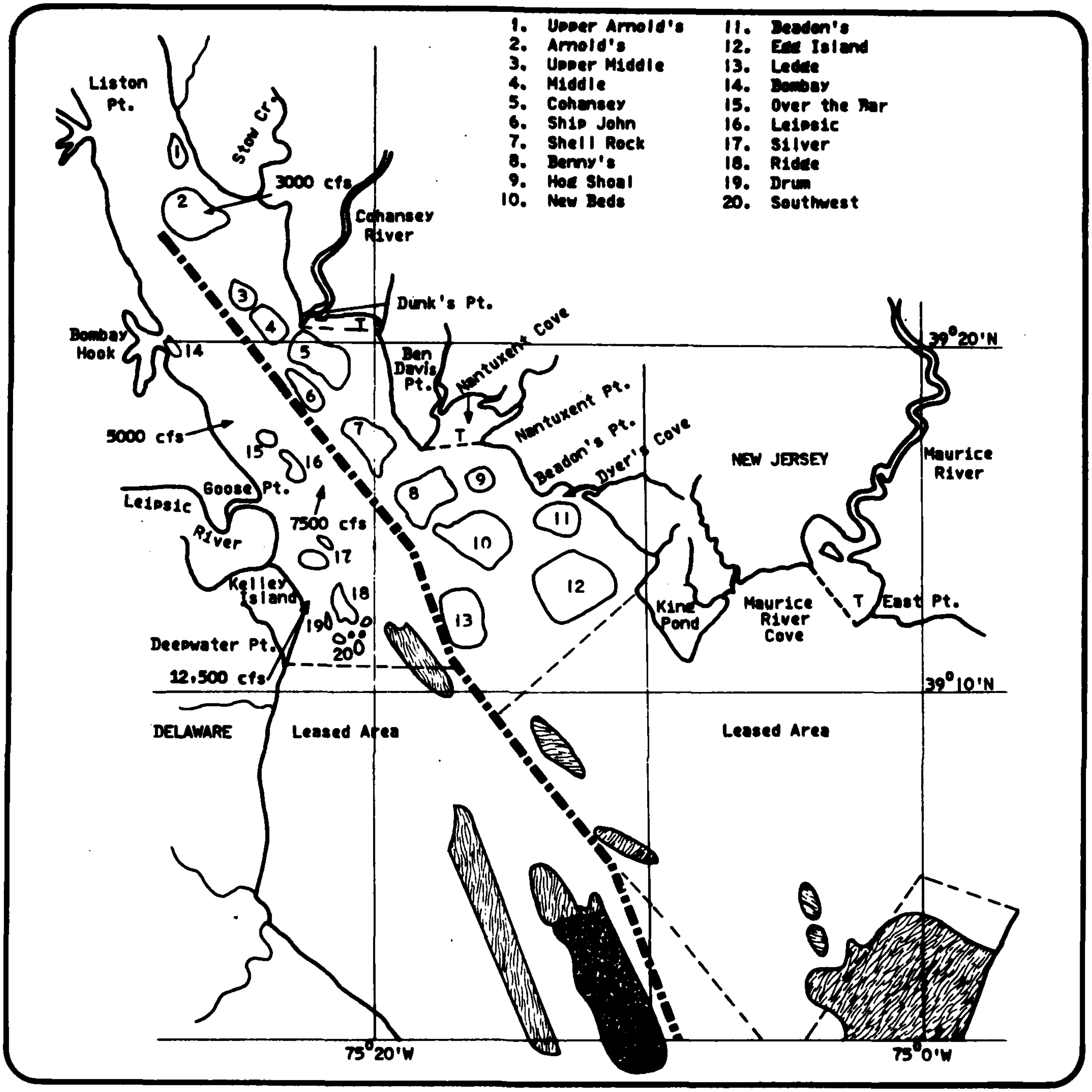
Direct evidence of contamination, however, exists principally with municipal wastes. Several natural seed oyster beds north of Dunk's Point, indicated in Figure 6-5, have been condemned because bacterial coliform levels are too high. These beds are designated as seed beds by law and thus would not be open to the production of market oysters even if the bacterial coliform level was acceptable.

VI.A.6(b) Present and Potential Productivity

Fish and shellfish productivity parallels the existing water quality conditions of the Delaware Basin waters. Three areas, reflecting different levels of productivity are defined and characterized below.

The region above Trenton, inclusive of the tributaries, provides good sport fishing. The productivity of these waters generally increases upstream with a substantial improvement north of Easton. The construction and operation of dams lacking fish passage facilities on many of the tributaries has precluded the passage of anadromous fish species and effectively reduced the amount of available spawning habitat. In addition, marked temperature differentials in the release waters of the New York State dams have diminished the carrying capacity of the upper basin waters.

The fishery value of the Trenton to Chesapeake-Delaware Canal reach has been virtually lost due to pollution. Bulkheading, dredging and filling



«THE NATURAL SEED OYSTER BEDS OF DELAWARE BAY»

VI 5

LEGEND

T—TONGING AREA

HARD CLAM

BLUE CRAB

A COMPREHENSIVE STUDY OF THE

TOCKS ISLAND LAKE PROJECT & ALTERNATIVES

URS/MADIGAN-PRAEGER, INC. & CONKLIN AND ROSSANT

operations have also significantly contributed to the decline of aquatic habitat, especially marsh/wetland areas. Thus, the upper Delaware River estuary no longer supports a balanced native population of fish. In fact, Betz Environmental Company (1975) reports a loss of over 20 species of fish between 1921 and 1968. Only populations of those few species with high pollution tolerance (e.g., brown bullhead) have not been adversely affected in this region.

The aquatic environment south of the Chesapeake-Delaware Canal to the mouth of Delaware Bay is extremely productive. These nutrient rich waters support a diverse array of finfish and shellfish industries including resident and visitant fresh water, estuarine, migratory, and marine species. The lower estuary and bay provide especially desirable nursery and spawning conditions for many marine organisms. Major commercial invertebrates include the oyster, hard clam, blue crab, and lobster (Figure 6-5). The oyster industry, described more fully below and in Chapter IX.H., is thriving once again following a disastrous period of MSX infection in the late 1950's and low flow conditions in the early 1960's. Hard clam populations have apparently declined in recent years, especially in New Jersey waters. Harvest of the blue crab has increased in the last few years, particularly in the upper estuary near Stow Creek. The American lobster is harvested near the mouth of the bay, though the extent and trends of its production in Delaware Bay have not yet been determined. If any factor is limiting in the bay at present, it is the high turbidity associated with tidal flux and river flushing.

Quantifying present and potential productivity of most Delaware Basin species in the forementioned regions, except possibly the American shad and oysters, is difficult. Most standing crop estimates are based on catch records or rotenone samples. The basin north of Easton is basically underfished and, thus, catch records are not really indicative of present and potential productivity. Short-term and seasonal movement by fish, natural population trends and cycles, and catastrophic stress factors (e.g., the hurricane Diane flooding in 1955 or industrial waste-derived fish kills) complicate standing crop evaluation. Thus, a description of relative productivity, in conjunction with water quality conditions and projections, is probably the key to an understanding of the present and potential productivity of the Delaware Basin. For more detailed delineation of the actual species diversity and pounds/acre or man/day figures, the Biological Evaluation of the Delaware River Estuary (Shuster, 1971), Tri-State Fishery Study (1962), and several Bureau of Sport Fish and Wildlife reports (1971), among others, should be consulted.

Shad and oyster data are historically more complete and are currently drawing more detailed analyses. As mentioned above and in Chapter IX.C.2, the shad decline is largely attributable to mainstem pollution and the destruction of spawning grounds. The annual commercial catch of shad has ranged between 50,000 to 500,000 pounds during the last fifty years after dropping from approximately 19 million pounds to 500,000 pounds between 1896 and 1920.

In the river itself, which supports only one commercial shad fishery at present, a population of approximately 100,000 shad attempt to spawn each year. This figure is subject to large cyclic fluctuations, however, as illustrated by the surprisingly heavy run in 1963 (1,000,000 shad). It is conceivable that with the ultimate removal of the Philadelphia-Camden pollution block and the return of spawning grounds in many of the major tributaries through the addition of passage facilities to existing dams, the river could support an annual shad run of 1,000,000 and possibly 1.7 million during a particularly heavy run (Delaware River Anadromous Fish Project). Such an increase would enhance the commercial shad fishery significantly in both the bay and river.

The principal factors which have or do control oyster production in Delaware Bay include management methods, disease, predation, and salinity. All these factors, alone or in concert, have influenced permanent and temporary changes in harvest. The impact of predation and salinity, and the inter-relationship between these two variables, will be reviewed thoroughly in Chapter IX.H.

Because the larva (spat) of the American oyster are planktonic for approximately two weeks in the summer, the location of their eventual setting on a hard, firm substrate (culch) is strongly influenced by the currents and bottom topography. Natural oyster beds or reefs tend to be self-sustaining with each year-class recruitment growing and reproducing on

the bed and eventually adding to the culch. Unfortunately, the hydrographic conditions which make these areas productive natural oyster seed beds produce oysters of low marketability due to small size and relatively poor meat quality. The common practice of transplanting seed oysters from the natural beds to leased waters in the bay, where 1 to 2 years of growth produce high quality oysters, has successfully eliminated this problem. The proximity of the natural oyster beds and leased areas in New Jersey and Delaware is illustrated in Figure 6-5.

Obviously, success of future harvests is highly dependent on the natural sets and culch development of previous oyster populations. Consequently, non-productive seasons are perpetuated and recovery is relatively slow. Lack of control of oyster and shell removal in the late 1940's and early 1950's, after the switch to dredging with motor powered boats, led to a marked reduction in the total area of the natural beds. Restrictions preventing oystermen from removing more than 15 percent of clean shells by volume (the rough cull law) and State replacement of at least 40 percent of the shell lost each year (either through direct return of Delaware Bay shells or buying additional shells from Chesapeake Bay) have been major factors accelerating the oyster industry comeback in recent years.

Compounding the oyster decline due to mismanagement, the MSX (Multinucleate Sphere X) invasion in the late 1950's and drought conditions in the early 1960's reduced the oyster harvest in Delaware waters to

under 100,000 bushels. MSX, a protozoan parasitic oyster disease, first appeared in the spring of 1957 and destroyed approximately 50 percent of the seed oysters on planted grounds in New Jersey waters. The beds in the vicinity of Egg Island suffered losses as high as 85 percent. Heavy damage continued through 1959, declined through 1963, and reappeared in 1964. Though the epizootic disease did infect the upper bay beds, damage was far less severe in these regions. It was later discovered that MSX could not persist in waters with salinity greater than 15 ppt. Recent evidence suggests that resistant strains of oysters have developed in the bay. At the New Jersey Research Laboratory, none of the experimentally imported stocks demonstrate the substantial resistance to MSX which characterizes the present native seed stock (e.g., 60 percent loss of James River oysters versus negligible damage to Delaware oysters, 1964).

Oyster production has ranged from a high of 3,500,000 bushels in 1929 to a low of 94,600 bushels in 1966. Last spring, however, more than 450,000 bushels of seed oysters were planted, originating from the upper bay natural seed beds. Expanding sets and beds are evident even in the southern seed beds below the 15 ppt isohaline. An ultimate harvest rate of one bushel for each bushel of seed oysters planted is generally attained in Delaware Bay. A stabilized 1,000,000 bushel/year harvest figure probably can be realized in the Bay, especially with improved management and harvest techniques and an increasing resistance to MSX (the average production level was 935,000 bushels between 1932-1956). Breeding of a more complete stock of resistant oysters, more efficient

control of predation, and raft-culturing could raise this figure to the 1,500,000 bushel level (annual harvests averaged 1,400,000 bushels between 1949 and 1956.

The overall productivity of other Delaware Basin fish and shellfish fisheries will increase similarly following the re-establishment of habitat defined by good physical characteristics. In the upper basin, more balanced and consistent releases would add to the enhancement of the river's fish as will more stringent restrictions on industrial wastes throughout the basin. With pollution abatement, re-introduction of desirable native species lost in the upper estuary could further elevate the productivity of these waters. In fact, there are several species established in the tidal and freshwater tributaries that are absent or extremely rate in the mainstem that would provide ideal re-stocking sources. Seemingly, the momentum of man's adverse impact upon the basin's resources is reversing such that the Delaware River system may again command the excellent and unique fish and shellfish resource it once possessed.

VI.B. OBJECTIVES AND STANDARDS

A necessary first step in water quality management planning is the determination of economically, socially, and technologically feasible objectives with which to guide the planning process. The next step is the determination of specific water quality standards designed to achieve these objectives. Existence of standards, however, is not enough to insure that water quality goals and objectives are met. The last step, then, is the development of specific programs, the success of which is a direct reflection on the feasibility of the chosen objectives. In this section, the objectives, standards, and programs mandated by the DRBC and Public Law 92-500 will be examined.

VI.B.1. DRBC OBJECTIVES AND STANDARDS

The objectives and standards of the DRBC with regard to water quality management are listed in the Water Code of the Basin (Comprehensive Plan). These objectives and standards will be evaluated in order to delineate the differences between the existing regulations of the DRBC Comprehensive Plan and what will become law when all the provisions of Public Law 92-500 become operational.

The overall objective of the DRBC is to maintain and ehance the quality of Delaware River Basin waters in a condition satisfactory for beneficial uses. The specific beneficial uses that have been identified are as follows: (1) agricultural, industrial, and public water supplies after

reasonable treatment; (2) fish, wildlife and other aquatic life; (3) recreation; (4) navigation; (5) controlled and regulated waste assimilation to the extent that such use is compatible with other uses; and (6) other such uses as may be provided by the Comprehensive Plan.

With regard to high quality interstate waters, the DRBC has developed the non-degradation objective. According to this objective, water quality which is higher than that established by stream quality objectives will be maintained in the higher quality state unless the Commission can be shown that economic or social developments or the improvement of another water body have greater precedence. Furthermore, the quality of tributary streams must be maintained at a level at least equal to the receiving water above the confluence with the tributary.

The DRBC standards consist of the specific water uses of all waters, numerical water quality criteria designed to protect the identified beneficial uses, and general waste discharge requirements. As mentioned in VI.A.1(b), this information is listed in Appendix (1), water uses for each stream in the Delaware Basin are identified in the Water Code. The specific values of the water quality parameters which must be complied with for protection of water uses with an adequate margin of safety are also listed in the Water Code.

General waste discharge requirements limit substances in municipal, industrial, and other discharges to those types and levels that will

not preclude attainment of specific water uses. In accordance with the above, concentrations of toxic substances shall not exceed values above levels recommended for rejection by the United States Public Health Service. Furthermore, the waters shall be substantially free of unsightly or malodorous floating solids, sludge deposits, debris, oil, scum and substances in concentrations or combinations which are toxic or harmful to human, animal, plant, or aquatic life, or that produce color, taste, odor of the water, or taint fish or shellfish flesh.

Other important waste discharge standards are directed at minimum treatment levels, provision of disinfection, allocation of capacity, and combined sewers. According to the DRBC, all wastes must receive a minimum of secondary treatment, regardless of receiving water standards. In addition, all wastes containing human excreta or pathogenic organisms must be effectively disinfected before discharge.

Whenever secondary treatment is inadequate to meet water quality objectives, greater treatment efficiency can be mandated by the DRBC through equitable apportionment of assimilative capacity. It is in this situation that the water quality models discussed in VI.A.2 prove valuable. Through the use of the models, the DRBC can determine the allowable criteria.

VI.B.2 DRBC PROGRAMS

Specific programs have been developed by the DRBC to meet their water quality objectives and standards. The nature and timetable of these programs, to a large extent, have been determined by existing institutional arrangements and special problems characteristic of the Delaware River Basin. The system designed for the city of Philadelphia is an example of a regional program. The sewage treatment system developed (Resolution 73-5) for the area encompassing the Tocks Island Lake Project and the Delaware Water Gap National Recreation Area is an example of an areawide plan involving three states and six counties. Salinity control, acid mine drainage control, and spill detection and abatement are examples of special programs.

VI.B.3 APPLICATION OF PUBLIC LAW 92-500

Public law 92-500, the Federal Water Pollution Control Act ammendments of 1972, establishes a phased system of objectives, standards, and programs which become increasingly more stringent as the law's ultimate goal is reached. This section will examine the future goals of PL-500. The specific objectives of the Act are summarized below.

1. To eliminate the discharge of pollutants to navigable waters by 1985;

2. To provide water quality which protects and fosters propagation of fish, shellfish and wildlife and allows recreation in and on the water by 1983;

3. To prohibit discharge of toxic pollutants in toxic amounts;

4. To provide financial assistance to construct publicly owned treatment systems;

5. To develop and implement area-wide waste treatment management plans; and

6. To develop technology necessary to carry out these goals.

A comparison of the present and future objectives of PL 92-500 reveals significant differences by 1985. Whereas the present law allows usage of the stream's assimilative capacity for further waste treatment, the ultimate goal of the law sets forth a final date (1985) for an end to all pollution. However, it appears unlikely that this goal will be reached by 1985 because of the inability of present day technology to economically treat wastewaters to zero pollutant discharge levels.

At the present time, the law mandates the states to identify water uses of streams, lakes, estuaries, bays and groundwater and to develop water quality objectives to protect these water uses. In the future, the concept of beneficial use protection through the application of

stream quality criteria will be supplanted by certain treatment standards.

With regard to industrial point dischargers, the best practicable control technology currently available, as defined by the EPA Administrator, must be in operation by July 1, 1977. By July 1, 1983, such point source dischargers must provide the best available technology economically achievable. For municipal treatment facilities, secondary treatment must be provided by July 1, 1977 and the best practicable waste treatment technology should be in operation by July 1, 1983. As a qualification to the firmness of the deadlines, the EPA Administrator may modify the 1983 requirements if the discharger is treating his wastes to the fullest extent that his economic resources will allow and is progressing toward the goal of zero pollutant discharge.

VI.B.3(c) The States

Each state's role in water quality management planning will be strengthened through the application of PL 92-500. The requirements of PL 92-500 require that each state develop its own schedule for planning and program implementation to conform to the 1977 and 1983 deadlines (unless these dates are changed). Each state will need to develop a priority list of projects which are consistent with both the water quality objectives to be attained and the availability of federal and state grants. In order to do this, development of area-wide waste treatment plans under Section 208 and basin waste treatment plans under Section 303 by the individual states will be mandated.

VI.B.4 ENGINEERING CONSIDERATIONS

The engineering aspects of both the standards and programs of the DRBC and those of PL 92-500 offer interesting insights into the progress and efficiency of waste treatment technology. In this regard, the engineering implications of secondary treatment, land disposal, chlorination, urban runoff, engery resources and of the higher levels of treatment mandated by PL 92-500 will be discussed.

As mentioned initially in VI.B.1, the DRBC Standards provide for provision of secondary treatment and chlorination in all cases, prohibition of combined sewers, and non-point source control. Considerable ingenuity will be needed in order to satisfy these treatment goals. The secondary treatment requirement indicates that, at a minimum, biological treatment (an activated sludge plant or a good trickling filter) or its equivalent will be needed. In order to achieve this standard, larger, more efficient waste treatment plants will be constructed. Smaller plants, in which supervision of operation is either non-continuous or not at a sufficient level of competence, often have difficulty achieving the desired biological treatment level. Operationally, the trickling filter will create fewer problems than activated sludge, although at a loss in treatment efficiency.

The question of disinfection of wastewater has of late been receiving renewed scrutiny, particularly when the receiving water constitutes

a source of municipal water supply. It was originally thought that the utilization of chlorine was sufficient in meeting the level of bacterial kill believed necessary and was not otherwise harmful. Recently, there has been the suggestion that there are compounds present in wastewater which react with the chlorine to become potentially harmful to people upon ingestion. Also, residual chlorine in discharged wastewater is toxic to fish. It is, therefore, conceivable that, in the near future, chlorine will not be permitted to be used for the disinfection of wastes entering the Delaware basin. If this occurs, an alternative disinfectant will have to be found.

An additional concern about maintenance of high levels of treatment efficiency occurs when a sewer system tributary combines stormflow with municipal waste. The sudden flow increase may tax the capability of the treatment system, and under DRBC rules, such increased flows will not be permitted if they reduce the acceptable level of treatment efficiency. Possible solutions to this problem are flow retention basins or repairing leaking sewers.

Another problem area is created by the DRBC requirement that, during dry weather, the settleable solids in the effluent be negligible. This will require effective and consistent operation of the sedimentation units that follow the biological treatment units. This additional condition is not often achieved in conventional secondary treatment plants. Industrial wastes, which constitute a potential overload

or treatment problem to the treatment facilities will require flow equalization or pretreatment in order to minimize their impact.

Non-point sources of wastes in the basin are related primarily to agricultural activities and urban stormwater runoff. In the case of agriculture, it is rarely economically feasible to discharge farm waste into community sewer systems for treatment. In order to meet the goal of no pollutant discharge, these wastes must be excluded from basin waterways. Land disposal is an example of a potential disposal method. Very few adequate facilities exist for urban stormwater runoff. Possible abatement measures include source controls, sewer separation, periodic flushing of the system, collection system controls, in-line storage, off-line storage, and removal, separation and change in the state of waste stream contaminants.

VI.B.5 FINANCIAL IMPLICATIONS

The financial implications of the DRBC standards are that all communities in the Delaware River Basin will have to finance the construction of plants required to conform to the 85 percent BOD removal requirement and efficient removal of settleable solids and turbidity. It is anticipated, of course, that federal funding will be available at present levels (i.e., 75 percent of eligible costs, supplemented by what state funds may be available). In this way, the programs of the DRBC and

PL 92-500 are inseparable, as the federal government will pay for a substantial share of the construction costs. The availability of substantial grants usually reduces the tendency of local political constituencies to oppose federal directives; in this case, however, the fact that operating costs engendered by the new technologies must be borne by local entities* may produce concern. In addition, it is conceivable that in this time of rising energy costs, projects already formulated will have to establish their energy effectiveness as an element of justification for construction.

All industries which will connect to sewers will be required by EPA regulations to pay allocated costs for construction and operation, as well as those costs associated with pretreatment, when necessary. Industries which dispose of their wastes separately from public facilities will not have the benefit of the financing options of these communities or their better borrowing rates.

While the costs of construction of point-source facilities to meet the 1977 and 1983 objectives appear to be eligible for grants, there is considerable uncertainty as to whether the costs of controlling non-point sources are eligible and, if they are, what the priority for such control might be. The answer to these questions will be based upon administrative edicts of the EPA. The area most affected will be the upstream rural and agricultural portions of the basin in which the majority of the non-point sources are located.

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*Except in New York State where grants offset a portion of the operating costs available.

VI.C. EFFECTS OF WATER QUALITY REQUIREMENTS UPON THE UPPER BASIN

In this section, the effects of present and future water quality requirements on the Delaware River above Port Jervis without the Tocks Island Dam will be examined.

VI.C.1 EXISTING

As discussed in VI.A.1(b), the present water quality of the East and West Branches of the Delaware River and its mainstream from Hancock to Port Jervis is generally excellent. However, the thermal regime of waters below the major water supply dams indicates that abnormally high temperatures can develop due to the small outflows allowed. The objectives and standards which guide the development of water quality programs in the area include those of the DRBC, the Department of Environmental Conservation (DEC) of New York and the Department of Environmental Resources (DER) of the Commonwealth of Pennsylvania. DRBC objectives of standards have have been discussed previously in VI.B.1. The objectives and standards of the DER and the DEC for the Delaware River essentially reflect those of the DRBC. It should be noted again that in these multi-jurisdictional areas, the more stringent standard applies.

As evidenced by the general high quality of area waters, pollution loads have had little overall effect, although in selected areas under low-flow summer conditions, D.O. sags and fish kills have occurred. The limited effect is primarily due to the low density of urbanization and industrialization. Point sources (both municipal and industrial) discharge both oxygen demanding waste and nutrients to the Delaware in this region. The magnitude and distribution of point and non-point source pollution is further defined in Chapter IX.A. (Eutrophication).

VI.C.2 FUTURE

The future water quality requirements for the upper basin have been essentially set forth in VI.B.3, where it was shown that PL 92-500, because of its stricter mandates, will guide water quality management. The following sections will examine the effects of planned or deferred implementation of PL 92-500 upon the upper basin.

As the DRBC, the DEC and the DER all require secondary treatment (85 percent BOD removal), the 1977 secondary treatment requirements for municipal wastes and best practicable treatment currently available for industrial wastes will have little impact on water quality.

Application of secondary treatment would eliminate some specific upper basin problems. For instance, the D.O. sag which occurs during low-flow summer periods on the West Branch below the sewage effluent outfalls of

the Village of Walton and Stamford would be reduced in order to meet water quality objectives for the West Branch of the Delaware. It would also reduce fish kills near Walton th ough the control of local food-industry wastes. A slight reduction in nutrient loads would occur too. According to work done by Hydroscience, non-point sources contribute the greatest amounts of nutrients to this reach. Therefore, very little change in the eutrophic condition of Cannonsville Reservoir would be expected. If New York City maintains its present schedule of cold water releases, severe temperature fluctuations will continue to occur. Although the impact of PL 92-500 on these thermal discharges is somewhat unclear, it is apparent that such conditions could be ameliorated by a cooperative agreement between New York State, New York City, the DRBC and the Delaware River Master. As discussed in VI.A.1(b), it's doubtful such an agreement will be reached until the eutrophic conditions in Cannonsville Reservoir are reduced.

Implementation of the 1983 requirements would require all treatment plants to be further upgraded from secondary treatment to best practicable treatment. However, best practicable treatment has not been defined as yet. It is safe to say though, that these treatment requirements would further decrease the input of BOD and nutr ents into upper basin waters from point sources. Only light water quality changes would be expected above 1977 levels.

Compliance with the 1985 goal of eliminating pollutant discharge to navigable waters would result in further reduction in nutrient input and some specific quality changes. For example, the eutrophic condition of Cannonsville Reservoir probably would decrease as the nutrient supply of point and non-point sources reached background levels. Although this process might take many years due to the recycling of nutrients between sediments and overlying water, the frequency and magnitude of blooms would be expected to decrease.

Deferred implementation of PL 92-500 would result in a temporal displacement of water quality improvements. From a technological viewpoint, a deferral might allow a significant breakthrough to substantially reduce the costs of best practicable and complete treatment. Financially, the changing demands of our society might either increase or decrease the funds earmarked for pollution control programs.

VI.C.3 EFFECTS UPON FISH AND WILDLIFE

In general, water pollution control standards to be imposed by PL 92-500 are advantageous to fish and shellfish populations throughout the Delaware River system. The aquatic environment of the upper basin will not be significantly altered by the implementation of these provisions, however, as it is characterized by excellent water quality already, wildlife is also not expected to be altered significantly.

Point-source control will eliminate any low dissolved oxygen areas while slightly reducing the influx of nutrients to these waters. Although fish productivity is related to nutrient addition (i.e., plankton and rooted aquatic vegetable growth), the control of point-source discharge in the upper basin will not decrease the productivity of these waters.

More significant nutrient loading is contributed by non-point sources. Ultimate control of these sources, if possible at all, might lead to a lowered carrying capacity of upper basin waters. It is conceivable, however, that the natural background nutrient content leached from upper basin soils is enough to maintain present aquatic fish and invertebrate populations even with non-point source control. In fact, the effect of nutrient influx from non-point sources is considerably buffered already by nutrient trapping and eventual nutrient burial in the New York reservoirs.

VI.D. EFFECTS OF WATER QUALITY REQUIREMENTS UPON THE CONTIGUOUS AREA

In this section the effects of present and future water quality requirements on the Delaware River between Port Jervis and East Stroudsburg will be examined.

VI.D.1 EXISTING WATER QUALITY REQUIREMENTS

As shown in VI.A.2(b), the water quality of the Delaware River between Tocks Island and Port Jervis is generally excellent. A comparison of monthly water quality measurements with existing water quality objectives indicates that these are being met. The other water quality requirements for the area include secondary treatment for all municipal waste treatment plants. According to the Tocks Island Regional Environmental Study (Roy F. Weston, 1970), there are 28 existing sewage treatment facilities in the Tocks Island area. The four major municipalities served are East Stroudsburg, Stroudsburg, Newton and Port Jervis. As of 1970 they had a total treatment capacity of 7.7 mgd. The balance of the treatment facilities serve "resorts, camps, clubs and schools." These plants are smaller than municipal plants, usually having capacities of less than 100,000 GPD, which, "in most cases, are not providing adequate treatment." (Weston, 1970). However, it's apparent that the assimilative capacity of the Delaware River is able to overcome these insufficiently treated wastes.

VI.D.2 FUTURE WATER QUALITY REQUIREMENTS

The future water quality requirements for the contiguous area will depend on future population growth caused by full use of the Delaware Water Gap National Recreation Area (DWGNRA). Enlargement of sewage treatment facilities will be considered and the consequent effect on water quality will be discussed.

VI.D.2(a) DWGNRA Without Tocks Island

The following assumptions have been applied in order that a regional sewage treatment plan in the contiguous area with the DWGNRA and a free flowing river can be evaluated.

The DWGNRA with a free flowing river could attract from 2,000,000 visitors a year to 4,000,000 visitors a year, depending on its facility mix and visitor control methods.

The Recreation Area is expected to provide two months of low off-season (December through January) visitation, four months of average off-season (February through March, October through November) visitation, and six months of peak season (April through September) visitation. The majority (about 70%) of the population will visit the DWGNRA on weekends.

The overnight facilities will attract roughly 5% of the visitors during the weekends of the viable ten month season (excluding two months of low off-season visitation).

Day use visitors will utilize a maximum of 30 gallons/person/day and day-night use visitors a maximum of 50 gallons/person/day.

THE DWGNRA without TILP will consist of dispersed recreational areas, each area offering a point of attraction.

The Delaware Water Gap National Recreation Area is expected to have a minimum yearly visitation of 2,000,000 visitors. During peak weekend days, 20,417 visitors (Table 6-12) are expected to pass through the recreation area. Since the park is not primarily water oriented, the park visitors are expected to orient toward hiking, canoeing, sight-seeing, camping, etc., all of which will decentralize visitation. The dispersion of visitors among the many recreation areas (Chapter XVIII) is, therefore, expected to be widespread.

Overnight users are expected to reach a maximum population of 1,021 campers per peak weekend day, at the annual 2,000,000 visitation level. These park users will be concentrated in the planned camping areas, all of which are expected to contain the proper sanitary facilities. Camping areas can be located at the discretion of the NPS to facilitate easy sanitary disposal. This may mean locating camping facilities within

Table 6-12 DWGNRA (With Free-Flowing River) Severage Estimates

ASSUMPTIONS	2,000,000 VISITORS						4,000,000 VISITORS					
	6 MONTH PEAK SEASON		4 MONTH OFF SEASON		2 MONTH LOW SEASON		6 MONTH PEAK SEASON		4 MONTH OFF SEASON		2 MONTH LOW SEASON	
70% Peak 25% Off 5% Low	1,400,000		500,000		100,000		2,800,000		1,000,000		200,000	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
30% Weekday 70% Weekend	420,000	980,000	150,000	350,000	30,000	70,000	840,000	1,960,000	300,000	700,000	60,000	140,000
Daily Visitation 120 days (24 x 5) 48 days (24 x 2) 80 days (16 x 5) 32 days (16 x 2) 40 days (8 x 5) 16 days (8 x 2)	3,500	20,417	1,875	10,938	750	4,375	7,000	40,833	3,750	21,875	1,500	8,750
Overnight Users 5% Weekend-Day/Night		1,021		547		219		2,042		1,094		438
30 gpd for Day Use 20 gpd Addition for Night Use	105,000	612,510 20,420	56,250	328,140 16,410	22,500	131,250 4,380	210,000	1,224,990 40,840	112,500	656,250 21,880	45,000	262,500 13,140
Total gpd	105,000	632,930	56,250	344,550	22,500	135,630	210,000	1,265,830	112,500	678,130	45,000	275,640

the proximity of established treatment facilities.

Based on maximum usage of thirty gallons per day per visitor, peak day visitor loads will result in daily sewerage of 612,510 gallons (Table 6-12). Peak season campers are expected to contribute an additional 20 gallons/person/day yielding an additional 20,420 GPD. The day-night recreational sewerage volume for the peak season (2,000,000 annual visitation levels) is expected to be 632,930 GPD.

The maximum of 4,000,000 visitors per year will double daily peak season visitation to 40,833 on weekend days. As can be seen from Table 6-12, total sewerage levels will have a maximum value of 1,265,830 (1.27 MGD). Off-season loads may reach 678,130 GPD.

The TIRES study estimated the peak seasonal TIRES area population (including parts of Pike and Monroe Counties in Pennsylvania, Sussex and Warren Counties in New Jersey, and Orange County in New York) at 248,900 in 1970 and projected a peak seasonal population level of 429,300 for 1980, as noted in the following table:

Table 6-13 TIRES Peak Seasonal Population Projections

TIRES POPULATION WITHIN COUNTY	TIRES POPULATION PROJECTION* 1970	1980	1990
Pike	32,300	56,400	95,300
Monroe	95,100	159,800	254,400
Orange	25,300	34,000	41.400
Sussex	93,100	149,000	221,800
Warren	13,100	30,100	51,500
Total	248,900	429,300	664,400

*The population pro ections do not include DWGNRA populations.

On the basis of the above, Weston and Associates then applied a multiplier of 100 gallons per day to the population figures to achieve a figure of "Peak Season Average Daily Wastewater Flow Projections". Tl : 5-county 1970 projection is 24.8 MGD, which is expected to increase to 43.1 MGD in 1980 and finally reach 66.6 MGD in 1990 (differences between flow projections and population projections are due to roundings in calculations)

More recent estimates for the TIRES study area are not available. However, total county resident populations (1970 census) are somewhat lower than TIRES resident projections within the TIRES area. Utilizing the

somewhat higher TIRES peak seasonal population figures and the recreational wastewater volumes provided in Table 6-12 for 2,000,000 and 4,000,000 visitors, it can be seen in the following table that the recreational sewerage loads represent a small percentage of the overall sewerage loads.

Talbe 6-14 DWGNRA Recreation Sewerage Loads for Six Month Peak Season*

TIRES Estimates of Overall Sewerage Loads	DWGNRA'S % of Overall Load: 2,000,000 Yearly Visitors	DWGNRA'S % of Overall Load: 4,000,000 Yearly Visitors
1970 - 24.8 MGD	2.6%	5.1%
1980 - 43.1 MGD	1.5%	2.9%
1990 - 66.6 MGD	1.0%	1.9%

*From Table 6-12

Considering the phasing of the park, the 2,000,000 visitor level should not be reac ıed until 1980. At that time, the peak season will contribute pproxiıııately 1.5 % of the projected sewerage load, Properly phased, the peak yearly assumption of 4,000,000 visitors would most likely be reached ln 1985 to 1990. At that time, the increasing population, which would be greater than the additional recreation population load, will have

oriented growth toward recreational support. Maximum visitation would add 1.9% to the 1990 sewerage loads.

As the previous analysis indicates, the activities of visitors using the facilities of DWGNRA will not contribute signifcantly to the amount of sewage effluent entering the free-flowing river or its tributaries. Accordingly, the major effects on water quality will stem from the mandates of PL 92-500 and increased growth. If the goals and requirements of PL 92-500 are met as scheduled, there should be no water quality degradation due to increased sewage discharge. In fact, water quality should improve as pollutant discharges are eliminated. Although no pollutant discharge is not feasible in all areas, it appears that the availability of sufficient land for disposal of chlorinated secondary effluent (Kardos and Sapper, 1973), makes no pollutant discharge particularly feasible in this area.

In no case should water quality objectives be exceeded as existing regulations are sufficient to force treatment plants to upgrade in order to reduce pollutant discharge to such water quality limited segments.

Existing treatment plants are presently capable of incorporating the increased recreational sewerage load into the current daily flows. East Stroudsburg and Newton plants are the only plants slightly exceeding design capacities (table 22-131).

The seasonality of the recreational visitors will not allow the establishment of large treatment facilities for recreational sewerage alone due to the biological process. However, small (100,000 GPD) plants operating on the chemical treatment process and portable units will be maintained by the NPS to handle the recreational population away from a township. This approach is strengthened considering the likely dispersion of visitors throughout the DWGNRA area due to the lack of a central focus point (TILP).

VI.D.3 EFFECT UPON THE FISHERIES

An influx of two to four million visitors/year will add considerable pressure to the existing aquatic environment. The mainstem between Port Jervis and East Stroudsburg is underfished at present. With DWGNRA, fishing pressure conceivably could alter the natural composition of the river as it becomes readily accessible. The activities associated with DWGNRA, however, are land oriented and direct adverse impact upon the river fishery is unlikely.

The Delware tributaries, which can be rapidly altered by introduced stress factors, will be vulnerable to degradation due to the potential prevalence of trails and campsites. Though it is difficult to predict the exact impact of four million people, it is clear that the manifestations of camping water usage (e.g., garbage) will not be aesthetically or biologically beneficial. The input of sewage, if not effectively

controlled, may further degrade the natural aquatic environment of the tributaries and mainstream. Fishing pressure is not expected to exceed resource supply, but monitoring the relationship between recreational use and fish trends in the streams is advisable. The establishment of a put-and-take fishery facility within the DWGNRA could provide additional sport fishing opportunities if stocking is considered necessary and/or desirable.

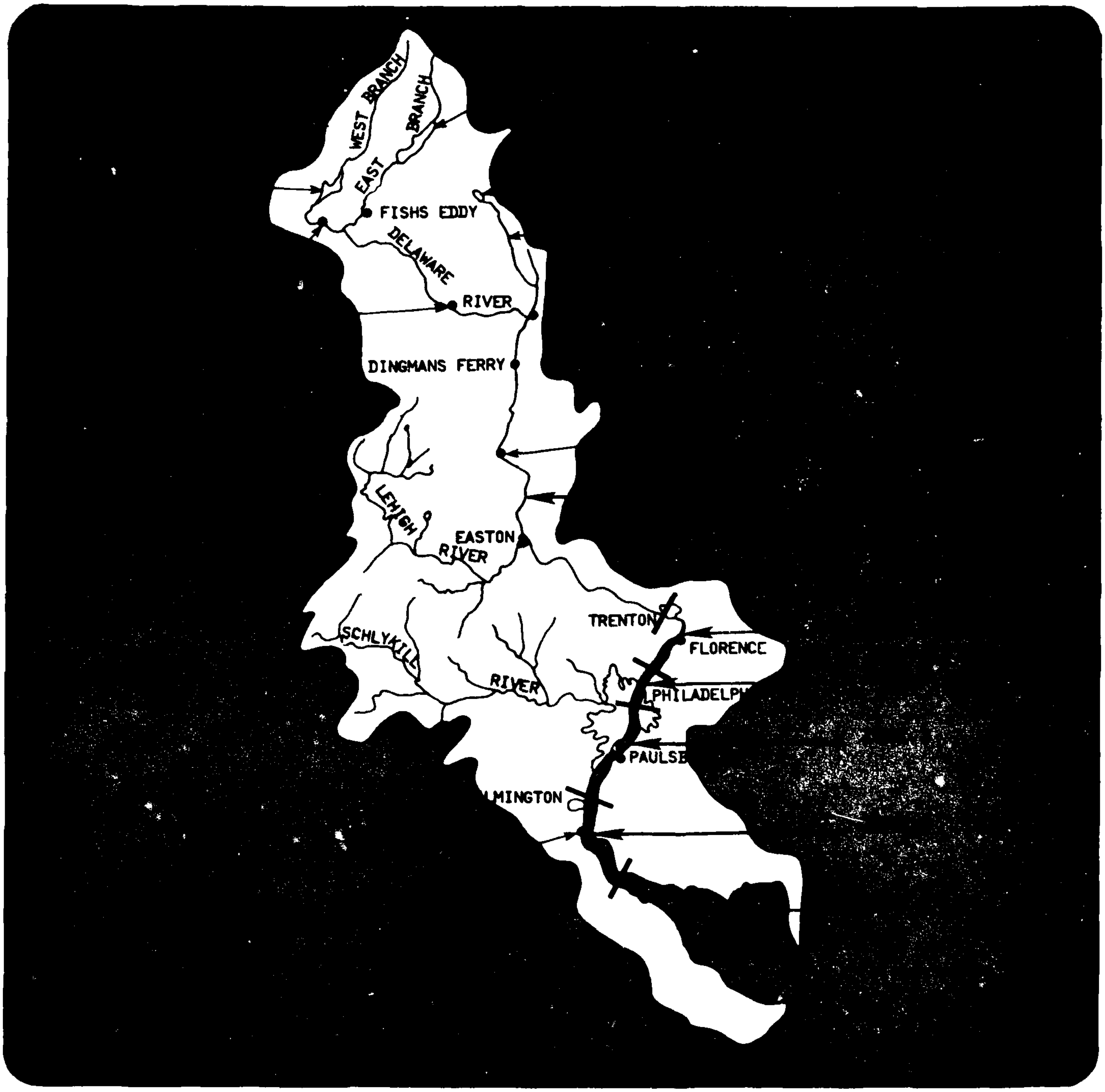
VI.E. EFFECTS OF DOWNSTREAM WATER QUALITY REQUIREMENTS

Differences between existing and future downstream requirements will be examined in this section. The water quality changes expected from these future requirements will be generally outlined.

VI.E.1 EXISTING

As shown in VI.A.3(b), the quality of water in the downstream reach varies from very good at the Delaware Water Gap to extremely poor in the estuary betwen Philadelphia and Marcus Point. The present water quality requirement for dischargers into the downstream reach depends on the location of the discharger.

In DRBC Zone 1, the reach between Tocks Island and Trenton, all dischargers must meet the secondary treatment requirements of 85% BOD removal. In Zones 2-5, DRBC regulations call for somewhat higher efficiencies depending on the carbonaceous oxygen demand (CBOD) assimilative capacity of the particular segment. Municipal and industrial sources are the prime dischargers although non-point sources amounted to about 22% of the total discharge.



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DRBC WATER QUALITY ZONES VI 6

A COMPREHENSIVE STUDY OF THE
TOCKS ISLAND LAKE PROJECT & ALTERNATIVES
URS / MADIGAN - PRAEGER, INC. & CONKLIN AND ROSSANT

Although the DRBC has set the above treatment requirements, not all of the dischargers to the Delaware River are presently meeting them. For instance, the city of Philadelphia is expected to comply with DRBC regulations by 1979 or 1980. Control of Philadelphia sewage is extremely important as it contributes about 45 percent of all organic pollutants discharged into the estuary. The program for the Philadelphia area was developed and financed by the City. The DRBC provided approval through their powers to determine the compatability of new programs with existing facilities, the water code, duly adopted regional plans, and future pollution control or water quality enhancing projects. The DRBC has a limited funding capacity and must rely on the federal government to grant municipalities the funds necessary for pollution control.

The DRBC also has a two-pronged program for the emergency alerting of water users and the emergency abatement of accidental pollution (spills). The alert system connects the Commission, water users and Federal, state and local organizations via telephone linkage.

It is also being extended to the sources (industries, pipeline companies, water and wastewater treatment operators and marina operators). The abatement system consists of 24-hour emergency clean-up teams whose costs are paid for by the discharger.

Because the estuarine waters in DRBC Water Quality Zones 2 and 3 are used for public water supply, the DRBC has established certain water quality objectives to protect the water quality. The standards in each zone for chlorides are as follows: (1) maximum 15-day mean of 50 mg/l in Zone 2, (2) maximum of 200 mg/l in Zone 3, and (3) maximum of 250 mg/l at R.M. 92.7, which is just above the mouth of the Schuylkill River. A recent study for the DRBC outlined the effects of flow changes at Trenton on compliance with these water quality objectives. These are summarized in the following table. As noted in Table 6-15 the current DRBC flow objective at Trenton is 3000 cfs. It should be noted that the BOD removal requirements for the various water quality zones were determined by using a Delaware River estuary model with a flow set at 3000 cfs. At lower flow rates and the prescribed levels of treatment, violations of water quality objectives can be expected.

VI.E.2 FUTURE

The future water quality requirements mandated by PL 92-500 will have a substantial effect on the treatment required by downstream dischargers. Initially, the 1977 requirement will have little effect on the

Table 6-15 Salinity Control Flows (Trenton)

ALTERNATIVE	CONSEQUENCES
3300 cfs	Salt Front (250 mg/l isochlor) at RM 90-91** (Near mouth of Little Mantua Creek and Philadelphia southwest boundary).
3000 cfs* (3600 cfs at Philadelphia)	Salt Front at RM 94** (1.5 mi. above mouth of Schuykill River). Minor violation of DRBC water quality standards' limits for chlorides.
2700 cfs	Salt Front at RM 96** (0.7 mi. S. of Philadelphia S.W. STP). Violation of DRBC water quality standards' limits for chlorides in Estuary Zones 3 and 4. 20 percent downward revision of Estuary Zone 2 waste land allocations required.
2400 cfs	Salt Front at RM 98** (Camden STP). Substantial violation of DRBC water quality standards' limits for chlorides in Estuary Zones 3 and 4. Substantial downward revision of Estuary Zone 2 waste load allocations required. Threat of saline intrusion of groundwater supply aquifers in N. J.
2100 cfs	Salt Front at RM 102** (Lehigh Ave., Philadelphia). Substantial violation of DRBC water quality standards' limits for chlorides in Estuary Zones 2, 3, and 4, including violation of 50 mg/l limit at Philadelphia Torresdale Water Filter Plant. Substantial downward revisions of waste load allocations in Zone 2 and possibly Zone 3 required. Saline intrusion of groundwater supply aquifers in N.J.

* Current DRBC Objective

** Approx. location

Source: DRBC Salinity Control Flow Policy Issue 1975

dischargers as all effluents within the DRBC zones must presently comply with at least secondary treatment standards. Full compliance with the present standards will result in water quality improvements, including substantial reductions in fecal coliforms and BOD levels in the estuary. Lesser reductions in nutrients and toxic materials are expected. Dissolved oxygen concentrations will improve in the estuary, however, recent work by the U.S. EPA indicate the D.O. improvements will not be as great as originally expected due to the effect of nitrogenous oxygen demand (NOD). Ninety-six percent BOD removal and 50 percent NOD removal would enable a 2.0 mg/l D.O. concentration in the estuary to be met at all times. Significant reductions in heavy metals and other toxic materials are also expected.

On time implementation of the 1983 standards of best practicable waste treatment technology economically achievable for industrial dischargers would force significant changes to occur. Although best practicable waste treatment technology for municipal waste treatment plants is not well defined in this area, future effluent requirements may include reductions in nitrogenous oxygen demand loadings. Nutrient reductions may also be expected. As mentioned in VI.B.4, the industrial waste treatment requirements will force industries to either pretreat and discharge to municipal treatment plants or construct their own waste treatment plants. When 1983 criteria are met, a significant improvement in the D.O. sag in the Philadelphia-Camden area will result.

Compliance with 1985 goals would increase the D.O. level above that contemplated above. However, stormwater dischargers, benthic oxygen demand created by sludge deposits built up throughout the years and inputs of organic materials from tributary streams must be reduced in order to maintain a minimum D.O. concentration of 4.0 mg/l.

Deferred implementation of the 1983 and 1985 standards and goals would result in significant deferred benefits and increased costs. Deferred implementation of the 1977 standard would have no effect as the DRBC and the states already require at least 85 percent BOD removal. Deferred implementation of the 1983 standards would result in an accrual of benefits to those industries and municipalities which could utilize funds presently earmarked for water pollution control efforts for other purposes. Significant expense to the commercial and recreational fishery due to the reduction in fish production would continue to occur. The effects of the zero pollutant discharge provision (1985 goal) deferral would depend upon the degree of treatment mandated by the 1983 standards.

VI.E.3 EFFECTS UPON FISH AND WILDLIFE

Though scheduling may be unclear, in the long-run PL 92-500 will definitely enhance the aquatic biota in the downstream and estuarine reaches of the basin. Most notably, ultimate elevation of the minimum DO concentration to the 4.0-5.0 mg/l range would have marked beneficial effects

upon the river's fish, particularly between Trenton and the Chesapeake-Delaware Canal (VI.A.6(b)). Substantial decreases in heavy metals and toxic materials will virtually eliminate the threat of these wastes to aquatic life. Leaching of bottom sediments and the commercial invertebrate's capacity for concentrating suspended and dissolved material, however, will extend the caution with toxic loads in these organisms long after PL 92-500 is implemented. Marked reductions in fecal coliforms could reopen the condemned oyster beds north of Dunk's Point to harvest of market oysters, though these beds are not and probably will not be used for this purpose (VI.A.6(b)). Similarly, the tributaries feeding into the bay may once again support marketable oyster populations.

Delaware Bay is extremely productive partly because it receives most of the basin's nutrient load. Though it is reasonable to assume a large reduction in total nutrient input to the bay as a result of PL 92-500, man's nutrient contribution will still be significant. The impact of any nutrient loss would be dependent upon the natural background levels and the limitations turbidity imposes upon productivity. At any rate, it is likely that Delaware Bay waters will receive a sufficiently rich natural nutrient loading rate to sustain present productivity levels.

APPENDIX A TO CHAPTER VI

DELAWARE RIVER BASIN COMMISSION

BASIN REGULATIONS - WATER QUALITY

APPENDIX A

DELAWARE RIVER BASIN COMMISSION
BASIN REGULATIONS – WATER QUALITY

Administering Agency: Delaware River Basin Commission
P.O. Box 360
Trenton, N.J. 08603

PART I – GENERAL; DEFINITIONS; COOPERATION

Article 1-1

General; Definitions

Section 1-1.1 General

(1) *Effect of the Comprehensive Plan.* The Comprehensive Plan prescribes standards which govern the review of proposed new projects and action by the Commission to control and abate pollution with respect to existing facilities. Section X of the Comprehensive Plan, *Water Quality Standards for the Delaware River Basin*, adopted April 26, 1967, sets forth these water quality standards.

(2) *Project Review.* The process by which the Commission will include projects in the Comprehensive Plan and review and screen proposed projects to determine their compatibility with the Plan is set forth in the Commission's Administrative Manual (Part II) – RULES OF PRACTICE AND PROCEDURE.

(3) *Control and Abatement.* These Regulations are adopted, pursuant to Article 5 and Section 14.2 of the Compact, to implement the cited Water Quality Standards. Where applicable state standards require higher quality water than these Standards and Regulations, state standards will be controlling.

Section 1-1.2 Definitions. For the purpose of these Regulations and for interpretation and application of the Comprehensive Plan, unless the context otherwise requires:

(1) "Standards" means Section X of the Comprehensive Plan as added by Resolution 67-7, dated April 26, 1967 (and reproduced in Part II hereof).

(2) "Pollution" means the introduction into waters of the Basin of substances or properties which impair the uses specified in the Comprehensive Plan.

(3) "Effluent quality requirements" mean the requirements relating to effluents which are prescribed by the Standards or by these Regulations.

(4) "Waste assimilation" means the chemical, physical, and biological process resulting when waste substances or properties are introduced into Basin waters.

(5) "Waste assimilative capacity" means the measure of a stream's capacity for waste assimilation without impairment of the uses designated by the Standards.

(6) "Water uses" means the protected uses prescribed by the Standards, and without limitation thereto:

a. "Agricultural use" includes water used for livestock and for irrigation;

b. "Industrial use" includes water for processing and cooling;

c. "Public water supplies" include water suitable for drinking purposes and for other domestic, industrial, municipal or institutional uses;

d. "Wildlife" includes all undomesticated animals and fowl;

e. "Fish and other aquatic life" include all species of resident, anadromous, and catadromous fish, shellfish, and other aquatic biota;

f. "Recreation" includes all water-contact sports.

(7) "Unregulated streams" means streams where the quantity of flow, including its distribution in time or place, are not significantly altered by the activities of works of man.

(8) "Regulated streams" are streams where the quantity of flow, including its distribution in time or place, are altered by the activities or works of man.

(9) Additional definitions. See Section 1.5 of Part II and Article 3 of Part III of these Regulations and Section 1.2 of the Compact.

Article 1-2

Interstate Cooperation

Section 1-2.1 Administrative Agreements. To avoid unnecessary duplication and achieve maximum efficiency, signatory agencies to the Delaware River Basin Compact concerned with pollution control will be utilized to the maximum practical extent in enforcing these Regulations. To that end, the Executive Director is authorized to enter into cooperative administrative agreements with these agencies.

Section 1-2.2 Additional State Requirements. Any of the signatory States may impose standards, including water quality criteria and effluent quality requirements, with respect to waste discharges within its jurisdiction in excess of those provided by the Comprehensive Plan and these Regulations.

PART II – COMPREHENSIVE PLAN, SECTION X, WATER QUALITY STANDARDS FOR THE DELAWARE RIVER BASIN

Article 2-1

Basinwide

Section 2-1.1 Water Uses

(1) *Uses paramount.* Water uses shall be paramount in determining stream quality objectives which, in turn, shall be the basis for determining effluent quality requirements.

(2) *Uses to be protected.* The quality of Basin waters shall be maintained in a safe and satisfactory condition for the following uses: (a) agricultural, industrial, and public water supplies after reasonable treatment, except where natural salinity precludes such uses; (b) wildlife, fish and other aquatic life; (c) recreation; (d) navigation; (e) controlled and regulated waste assimilation to the extent that such use is compatible with other uses; and (f) such other uses as may be provided by the Comprehensive Plan.

Section 2-1.2 Stream Quality Objectives

(1) *Limits.* The waters of the Basin shall not contain substances attributable to municipal, industrial, or other discharges in concentrations or amounts sufficient to preclude the specified water uses to be protected. Within this requirement, the waters shall be substantially free from unsightly or malodorous nuisances due to floating solids, sludge deposits, debris, oil, scum, substances in concentrations or combinations which are toxic or harmful to human, animal, plant, or aquatic life, or that produce color, taste, odor of the water, or taint fish or shellfish flesh. In no case shall concentrations of substances exceed those values given for rejection of water supplies in the United States Public Health Service Drinking Water Standards.

(2) *Nondegradation of Interstate Waters.* It is the policy of the Commission to maintain the quality of interstate waters, where existing quality is better than the established stream quality objectives, unless it can be affirmatively demonstrated to the Commission that such change is justifiable as a result of necessary economic or social development or to improve significantly another body of water. In implementing this policy, the Commission will require the highest degree of waste treatment determined to be practicable. No change will be considered which would be injurious to any designated present or future use. In the implementation of this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act.

Section 2-1.3 Effluent Quality Requirements

(1) *Minimum treatment.* All wastes shall receive a minimum of secondary treatment, regardless of the stated stream quality objective.

(2) *Disinfection.* Wastes (exclusive of stormwater bypass) containing human excreta or disease producing organisms shall be effectively disinfected before being discharged into surface bodies of water.

(3) *Public safety.* Effluents shall not create a menace to public health or safety at the point of discharge.

(4) *Limits.* Discharges shall not contain more than negligible amounts of debris, oil, scum or other floating materials, suspended matter which will settle to form sludge, toxic substances, or substances or organisms that produce color, taste, odor of the water, or taint fish or shellfish flesh.

(5) *Allocation of capacity.* Where necessary to meet the stream quality objectives, the waste assimilative capacity of the receiving waters shall be allocated in accordance with the doctrine of equitable apportionment.

Section 2-1.4 Other Considerations

(1) *Combined sewers.* Any new facility or project combining sanitary or industrial waste with stormwater drainage which would have a substantial effect on the quality of waters of the Basin shall not be permitted, whether or not any such project or facility discharges into an existing combined system.

(2) *Access and reports.* The Commission, or its duly authorized representatives, shall have access, at reasonable hours, to observe and inspect waste treatment facilities and to collect samples for analyses. Upon written request, waste treatment facility operation reports shall be submitted to the Commission.

(3) *Zones.* The Delaware River and Bay and their tributaries may be divided into zones which will facilitate the management of surface and underground water quality.

(4) *Streamflow.* Numerical stream quality objectives are based on a minimum consecutive 7-day flow with a 10-year recurrence interval.

Section 2-1.5 Definitions

(1) *Biochemical oxygen demand.* Biochemical oxygen demand as determined under standard laboratory procedures for 5 days at 20 degrees C.

(2) *Carbonaceous oxygen demand.* That part of the ultimate oxygen demand associated with biochemical oxidation of carbonaceous, as distinct from nitrogenous, material.

(3) *Effective disinfection.* The destruction of pathogenic organisms in such manner and under such controls as shall be prescribed by Commission regulations.

(4) *Secondary treatment.* The removal of practically all suspended solids at all times and the reduction of the biochemical oxygen demand by at least 85 percent, and may include the in-plant control of industrial wastes as prescribed by the Commission.

(5) *River mile.* The distance, in statute miles, of a location or item measured from "mile zero."

a. *Delaware Bay and River.* Mile zero is located at the intersection of the centerline of the navigation channel and a line between the Cape May Light and the tip of Cape Henlopen. Distances from mile zero are measured essentially along the centerline of the navigation channel up to the Trenton-Morrisville Toll Bridge (R. M. 133.4) and above that point along the State boundary line as shown on published quadrangle maps of the United States Geological Survey.

b. *Tributaries.* Mile zero is located at the intersection of the centerline of the tributary and a line joining the opposite banks at its mouth. Distances from mile zero are measured along the centerline of the tributary.

Section 2-1.6 Application. This Article shall apply to all surface waters of the Delaware River Basin.

Article 2-2

Interstate Streams Nontidal

Section 2-2.1 Application. This Article shall apply to the interstate nontidal streams of the Delaware River Basin.

Section 2-2.2 Description. The interstate nontidal streams of the Delaware River Basin are those rivers, lakes, and other waters that flow across or form a part of state boundaries. The interstate waters are further classified as follows:

(1) Zone 1A is that part of the Delaware River extending from the confluence of the East and West Branches of the Delaware River at Hancock, New York, R.M. (River Mile) 330.7, to the U.S. Route 106 bridge at Narrowsburg, New York, R.M. 289.9.

(2) *Zone 1B* is that part of the Delaware River extending from the U.S. Route 106 bridge at Narrowsburg, New York, R.M. 289.9, to the U.S. Routes 6 and 209 bridge at Port Jervis, New York, R.M. 254.75.

(3) *Zone 1C* is that part of the Delaware River extending from the U.S. Routes 6 and 209 bridge at Port Jervis, New York, R.M. 254.75, to Tocks Island Dam, R.M. 217.0 (proposed axis of dam).

(4) *Zone 1D* is that part of the Delaware River extending from Tocks Island Dam, R.M. 217.0 (proposed axis of dam), to R.M. 185.0, above Easton, Pennsylvania.

(5) *Zone 1E* is that part of the Delaware River extending from R.M. 185.0, above Easton, Pennsylvania, to the head of tidewater at Trenton, New Jersey, R.M. 133.4 (Trenton-Morrisville Toll Bridge).

(6) *Zone E* is East Branch Delaware River extending from its source in the town of Roxbury, Delaware County, New York, to its mouth at Hancock, New York, at R.M. 330.7 on the Delaware River.

(7) *Zone W1* is West Branch Delaware River extending from its source in the town of Jefferson, Schoharie County, New York, to its mouth at Hancock, New York, at R.M. 330.71 on the Delaware River.

(8) *Zone W2* is Sand Pond Creek extending from R.M. 1.8 at the confluence of Sherman Creek and Starboard Creek in Pennsylvania to its mouth in New York at R.M. 10.1 on the West Branch Delaware River; Cat Hollow Brook extending from its source in New York to its mouth in Pennsylvania at R.M. 1.05 on Sand Pond Creek; Sherman Creek in Pennsylvania extending from its source to its mouth at R.M. 1.8 on Sand Pond Creek; an unnamed tributary of Sherman Creek extending from its source in New York to its mouth in Pennsylvania at R.M. 1.6 on Sherman Creek; and Starboard Creek extending from its source in Lake Oquaga in New York to its mouth in Pennsylvania at R.M. 1.81 on Sand Pond Creek.

(9) *Zone N1* is that part of the Neversink River extending from R.M. 0.5 at its confluence with Clove Brook to its mouth on the Delaware River at R.M. 253.64.

(10) *Zone N2* is Clove Brook extending from its source in Steeny Kill Lake in New Jersey to its mouth in New York at R.M. 0.5 on the Neversink River; an unnamed tributary of Clove Brook extending from its source in New York to its mouth in New Jersey at R.M. 1.0 on Clove Brook; and an unnamed tributary to the above unnamed tributary of Clove Brook extending from its source in New York to its mouth in New Jersey at R.M. 0.7 on the unnamed tributary of Clove Brook.

(11) *Zone C1* is that part of the Christina River extending from its source in Pennsylvania to the head of tidewater at R.M. 16.3 at the outlet of Smalley's Pond in Delaware.

(12) *Zone C2* is West Branch Christina River extending from its source in Maryland to its mouth on the Christina River in Delaware at R.M. 25.7. Persimmon Run extending from its source in Maryland to its mouth on the West Branch Christina River in Delaware at R.M. 0.8; and East Branch Christina River extending from its source in Pennsylvania to its mouth on the Christina River in Delaware at R.M. 30.2

(13) *Zone C3* is White Clay Creek extending from its source in Pennsylvania to R.M. 14.7 at the Pennsylvania-Delaware State line.

(14) *Zone C4* is that part of White Clay Creek extending from R.M. 14.7 at the Pennsylvania-Delaware State line to its mouth on the Christina River in Delaware at R.M. 10.0.

(15) *Zone C5* is that part of Red Clay Creek extending from the confluence of the East and West Branches of Red Clay Creek in Pennsylvania at R.M. 13.4 to R.M. 12.6, at the Pennsylvania-Delaware State line; and West Branch Red Clay Creek extending from its source to its mouth on Red Clay Creek at R.M. 13.4.

(16) *Zone C6* is that part of Red Clay Creek extending from R.M. 12.6 at the Pennsylvania-Delaware State line to its mouth on White Clay Creek in Delaware at R.M. 2.6.

(17) *Zone C7* is that part of Brandywine Creek extending from the confluence of the East and West Branches of Brandywine Creek in Pennsylvania at R.M. 20.0 to the head of tidewater at R.M. 2.0 at the Market Street Bridge in Wilmington, Delaware; and West Branch Brandywine Creek extending from its source to its mouth on Brandywine Creek at R.M. 20.0.

(18) *Zone C8* is Naaman Creek extending from its source in Pennsylvania to the head of tidewater in Delaware.

Section 2-2.3 Water Uses to be Protected. The quality of interstate nontidal waters shall be maintained in a safe and satisfactory condition for the uses specified in Column 2 of Table II-1. The following designations apply to that column:

A. Agricultural, industrial, and public water supplies after reasonable treatment.

B. Wildlife, maintenance and propagation of resident game fish and other aquatic life.

C. Maintenance and propagation of trout.

D. Spawning and nursery habitat for anadromous fish.

E. Passage of anadromous fish.

F. Recreation.

Section 2-2.4 Stream Quality Objectives. The stream quality objectives of the interstate nontidal waters shall be those specified in Column 3 of Table II-1. The following designations apply to that column:

A. Dissolved oxygen.

1. Not less than 5.0 mg/l at any time.
2. Not less than 4.0 mg/l at any time.

B. Temperature.

1. Not to exceed five degrees F rise above natural temperature until stream temperature reaches 70 degrees F; natural temperature will prevail above 70 degrees F.

2. Not to exceed 5 degrees F rise above natural temperature until stream temperature reaches 87 degrees F, except in heat dissipation areas which may be designated by the Commission; natural temperature will prevail above 87 degrees F, except in designated heat dissipation areas.

C. pH

1. Between 6.0 and 8.5.
2. Between 6.5 and 8.5.

D. Phenols – not to exceed 0.005 mg/l.

E. Threshold odor number – not to exceed 24 at 60 degrees C.

F. Synthetic detergents (M.B.A.S.) – not to exceed 0.5 mg/l.

G. Fluorides – not to exceed 1.0 mg/l.

H. Alkalinity – not less than 20 mg/l.

I. Radioactivity–

alpha emitters – not to exceed 3 pc/l (picocuries per liter);

beta emitters – not to exceed 1,000 pc/l.

J. Turbidity – not to exceed the natural background by 10 units or a maximum of 25 units, whichever is less, except following precipitation; increases not to be attributable to industrial waste discharges.

K. Fecal coliform – not to exceed 200 per 100 milliliters as a geometric mean; samples shall be taken at such frequency and location as to permit valid interpretation.

Section 2-2.5 Effluent Quality Requirements. The effluent quality requirements interstate nontidal waters shall be those specified in Column 4 of Table II-1. The following designations shall apply to that column:

A. All discharges shall meet the effluent quality requirements of Article 2-1. The carbonaceous oxygen demand from an outfall (exclusive of stormwater bypass) shall not exceed that assigned by the Commission to maintain stream quality objectives.

TABLE II-1

Water Quality Standards for Interstate, Nontidal Streams in Terms of Minimum Water Uses, Stream Quality Objectives and Effluent Quality Requirements

Zone (1)		Water uses (2)	Stream quality objectives (3)	Effluent quality requirements (4)
1A.	Delaware River, Hancock to Narrowsburg	ABCDF	A1,B1,C1,D,E,F,I,K	A
1B.	Delaware River, Narrowsburg to Port Jervis	ABDEF	A2,B2,C1,D,E,F,I,K	A
1C.	Delaware River, Port Jervis to Tocks Island	ABDEF	A2,B2,C1,D,E,F,I,K	A
1D.	Delaware River, Tocks Island to Easton	ABDEF	A2,B2,C1,D,E,F,I,K	A
1E.	Delaware River, Easton to Trenton	ABDEF	A2,B2,C1,D,E,F,H,I,K	A
E.	East Branch Delaware River	ABCF	A1,B1,C1,D,E,F,I,K	A
W1.	West Branch Delaware River	ABCF	A1,B1,C1,D,E,F,I,K	A
W2.	Sand Pond Creek, Cat Hollow Brook, Sherman Creek, Starboard Creek	ABCF	A1,B1,C1,D,E,F,I,K	A
N1.	Neversink River, R.M. 0.0 to 0.5	ABF	A2,B2,C2,D,E,F,I,K	A
N2.	Clove Brook and its interstate tributaries	ABCF	A1,B1,C2,D,E,F,I,K	A
C1.	Christina River above Smalley's Pond	ABF	A2,B2,C1,D,E,F,I,J,K	A
C2.	East and West Branches Christina River, Persimmon Run	ABF	A2,B2,C1,D,E,F,I,J,K	A
C3.	White Clay Creek in Pennsylvania	ABCF	A1,B1,C1,D,E,F,I,J,K	A
C4.	White Clay Creek in Delaware	ABF	A2,B2,C1,D,E,F,I,J,K	A
C5.	Red Clay Creek in Pennsylvania and West Branch Red Clay Creek	ABCF	A1,B1,C1,D,E,F,I,J,K	A
C6.	Red Clay Creek in Delaware	ABF	A2,B2,C1,D,E,F,I,J,K	A
C7.	Brandywine Creek and West Branch Brandywine Creek	ABDEF	A2,B2,C2,D,E,F,G,I,J,K	A
C8.	Naaman Creek	ABF	A2,B2,C1,D,E,F,I,K	A

Article 2-3

Interstate Streams—Tidal

Section 2-3.1 Application. This Article shall apply to the Delaware River Estuary and Bay, including the tidal portions of the tributaries thereof.

Section 2-3.2 Zone 2

(1) *Description.* Zone 2 is that part of the Delaware River extending from the head of tidewater at Trenton, New Jersey, R.M. (River Mile) 133.4 (Trenton-Morrisville Toll Bridge) to R.M. 108.4 below the mouth of Pennypack Creek, including the tidal portions of the tributaries thereof.

(2) *Water uses to be protected.* The quality of Zone 2 waters shall be maintained in a safe and satisfactory condition for the following uses: (a) agricultural, industrial, and public water supplies after reasonable treatment; (b) wildlife, maintenance and propagation of resident fish and other aquatic life, passage of anadromous fish; (c) recreation; and (d) navigation.

(3) *Stream quality objectives.*

a. *Dissolved oxygen.* Daily average concentration shall not be less than 5.0 mg/1, except during the periods from April 1 to June 15 and September 16 to December 31 when the dissolved oxygen shall not average less than 6.5 mg/1.

b. *pH.* Between 6.5 and 8.5.

c. *Total alkalinity.* Between 20 and 100 mg/1.

d. *Temperature.* Shall not exceed 5 degrees F above the average daily temperature gradient displayed during the 1961-66 period, or a maximum of 86 degrees F, whichever is less.

e. *Phenols.* Maximum 0.005 mg/1.

f. *Threshold odor number.* Not to exceed 24 at 60 degrees C.

g. *Syndets.* (synthetic detergents) measured as M.B.A.S. (methylene blue active substances). Maximum monthly mean 0.5 mg/1.

h. *Turbidity.* Maximum monthly mean 40 units, maximum 150 units.

i. *Radioactivity.* – alpha emitters, maximum 3 pc/1 (picocuries per liter); beta emitters, maximum 1,000 pc/1.

j. *Chlorides.* Maximum 15-day mean 50 mg/1.

k. *Hardness.* Maximum monthly mean 95 mg/1.

l. *Fecal coliform.* Maximum geometric mean of 200 per 100 milliliters above R.M. 117.81 and 770 per 100 milliliters below R.M. 117.81; samples shall be taken at such frequency and location as to permit valid interpretation.

(4) *Effluent quality requirements.* All discharges shall meet the effluent quality requirements of Article 2-1. The carbonaceous oxygen demand from all outfalls in the zone (exclusive of stormwater bypass) shall not exceed that assigned by Commission regulations.

Section 2-3.3 Zone 3

(1) *Description.* Zone 3 is that part of the Delaware River extending from R.M. 108.4 to R.M. 95.0 below the mouth of Big Timber Creek, including the tidal portions of the tributaries thereof.

(2) *Water uses to be protected.* The quality of Zone 3 waters shall be maintained in a safe and satisfactory condition for the following uses: (a) agricultural, industrial, and public water supplies after reasonable treatment; (b) wildlife, maintenance of resident fish and other aquatic life, passage of anadromous fish; (c) recreation; and (d) navigation.

(3) *Stream quality objectives.*

a. *Dissolved oxygen.* Daily average concentration shall not be less than 3.5 mg/1, except during the periods from April 1 to June 15 and September 16 to December 31 when the dissolved oxygen shall not average less than 6.5 mg/1.

b. *pH.* Between 6.5 and 8.5.

c. *Total alkalinity.* Between 20 and 120 mg/1.

d. *Temperature.* Shall not exceed 5 degrees F above the average daily temperature gradient displayed during the 1961-66 period, or a maximum of 86 degrees F, whichever is less.

e. *Phenols.* Maximum 0.005 mg/1.

f. *Threshold odor number.* Not to exceed 24 at 60 degrees C.

g. *Syndets.* (M.B.A.S.) Maximum monthly mean 1.0 mg/1.

h. *Turbidity.* Maximum monthly mean 40 units, maximum 150 units.

i. *Radioactivity.* – alpha emitters, maximum 3 pc/1 (picocuries per liter); beta emitters, maximum 1,000 pc/1.

j. *Chlorides.* Maximum 200 mg/1.

k. *Hardness.* Maximum monthly mean 150 mg/1.

l. *Fecal coliform.* Maximum geometric mean of 770 per 100 milliliters; samples shall be taken at such frequency and location as to permit valid interpretation.

(4) *Effluent quality requirements.* All discharges shall meet the effluent quality requirements of Article 2-1. The carbonaceous oxygen demand from all outfalls in the zone (exclusive of stormwater bypass) shall not exceed that assigned by Commission regulations.

Section 2-3.4 Zone 4

(1) *Description.* Zone 4 is that part of the Delaware River extending from R.M. 95.0 to R.M. 78.8, the Pennsylvania-Delaware boundary line, including the tidal portions of the tributaries thereof.

(2) *Water uses to be protected.* The quality of Zone 4 waters shall be maintained in a safe and satisfactory condition for the following uses: (a) industrial water supply after reasonable treatment; (b) wildlife, maintenance of resident fish and other aquatic life, passage of anadromous fish; (c) recreation; and (d) navigation.

(3) *Stream quality objectives.*

a. *Dissolved oxygen.* Daily average concentration shall not be less than 3.5 mg/1, except during the periods from April 1 to June 15 and September 16 to December 31 when the dissolved oxygen shall not average less than 6.5 mg/1.

b. *pH.* Between 6.5 and 8.5.

c. *Total alkalinity.* Between 20 and 120 mg/1.

d. *Temperature.* Shall not exceed 5 degrees F above the average daily temperature gradient displayed during the 1961-66 period, or a maximum of 86 degrees F, whichever is less.

e. *Phenols.* Maximum 0.02 mg/1.

f. *Threshold odor number.* Not to exceed 24 at 60 degrees C.

g. *Syndets.* (M.B.A.S.) Maximum monthly mean 1.0 mg/l.

h. *Turbidity.* Maximum monthly mean 40 units, maximum 150 units.

i. *Radioactivity.* alpha emitters, maximum 3 pc/l; beta emitters, maximum 1,000 pc/l.

j. *Chlorides.* Maximum 250 mg/l at R.M. 92.47.

k. *Fecal coliform.* Maximum geometric mean of 770 per 100 milliliters; samples shall be taken at such frequency and location as to permit valid interpretation.

(4) *Effluent quality requirements.* All discharges shall meet the effluent quality requirements of Article 2-1. The carbonaceous oxygen demand from all outfalls in the zone (exclusive of stormwater bypass) shall not exceed that assigned by Commission regulations.

Section 2-3.5 Zone 5

(1) *Description.* Zone 5 is that part of the Delaware River extending from R.M. 78.8 to R.M. 48.2, Liston Point, including the tidal portions of the tributaries thereof.

(2) *Water uses to be protected.* The quality of Zone 5 waters shall be maintained in a safe and satisfactory condition for the following uses: (a) industrial water supply after reasonable treatment; (b) wildlife, maintenance of resident fish and other aquatic life, propagation of resident fish from R.M. 70.0 to R.M. 48.2, passage of anadromous fish; (c) recreation; and (d) navigation.

(3) *Stream quality objectives*

a. *Dissolved oxygen.* Daily average concentration shall not be less than 3.5 mg/l at R.M. 78.8, 4.5 mg/l at R.M. 70.0 and 6.0 mg/l at R.M. 59.5, except during the periods from April 1 to June 15 and September 16 to December 31 when the dissolved oxygen shall not average less than 6.5 mg/l in the entire zone.

b. *pH.* Between 6.5 and 8.5.

c. *Total alkalinity.* Between 20 and 120 mg/l.

d. *Temperature.* Shall not exceed 5 degrees F above the average daily temperature gradient displayed during the 1961-66 period, or a maximum of 86 degrees F, whichever is less.

e. *Phenols.* Maximum 0.02 mg/l.

f. *Threshold odor number.* Not to exceed 24 at 60 degrees C.

g. *Syndets.* (M.B.A.S.) Maximum monthly mean 1.0 mg/l.

h. *Turbidity.* Maximum monthly mean 40 units, maximum 150 units.

i. *Radioactivity.* alpha emitters, maximum 3 pc/l (picocuries per liter), beta emitters, maximum 1,000 pc/l.

j. *Fecal coliform.* Maximum geometric mean of 770 per 100 milliliters, samples shall be taken at such frequency and location as to permit valid interpretation.

(4) *Effluent quality requirements.* All discharges shall meet the effluent quality requirements of Article 2-1. The carbonaceous oxygen demand from all outfalls in the zone (exclusive of stormwater bypass) shall not exceed that assigned by Commission regulations.

Section 2-3.6 Zone 6

(1) *Description.* Zone 6 is that part of Delaware Bay extending from R.M. 48.2 to R.M. 0.0, the Atlantic Ocean, including the tidal portions of the tributaries thereof.

(2) *Water uses to be protected.* The quality of Zone 6 waters shall be maintained in a safe and satisfactory condition for the following uses: (a) industrial water supply after reasonable treatment; (b) wildlife, maintenance and propagation of resident fish, shellfish, and other aquatic life, and passage of anadromous fish; (c) recreation; and (d) navigation.

(3) *Stream quality objectives.*

a. *Dissolved oxygen.* Daily average concentration shall not be less than 6.0 mg/l.

b. *pH.* Between 6.5 and 8.5.

c. *Total alkalinity.* Between 20 and 120 mg/l.

d. *Temperature.* Shall not exceed 5 degrees F above the average daily temperature gradient displayed during the 1961-66 period, or a maximum of 86 degrees F, whichever is less.

e. *Phenols.* Maximum 0.02 mg/l.

f. *Threshold odor number.* Not to exceed 24 at 60 degrees C.

g. *Syndets.* (M.B.A.S.) Maximum monthly mean 1.0 mg/l.

h. *Turbidity.* Maximum monthly mean 40 units, maximum 150 units.

i. *Radioactivity.* – alpha emitters, maximum 3 pc/l (picocuries per liter); beta emitters, maximum 1,000 pc/l.

j. *Coliform.* MPN (most probable number) not to exceed U.S. Public Health Service's shellfish standards in designated shellfish areas.

k. *Fecal coliform.* Maximum geometric mean of 200 per 100 milliliters; samples shall be taken at such frequency and location as to permit valid interpretation.

(4) *Effluent quality requirements.* All discharges shall meet the effluent quality requirements of Article 2-1. The carbonaceous oxygen demand from an outfall (exclusive of stormwater bypass) shall not exceed that assigned by the Commission to maintain stream quality objectives.

PART III - APPLICATION OF STANDARDS

Article 3-1

Section 3-1.1 Water Uses. Protected water uses are as prescribed by the Comprehensive Plan. In the interpretation and application of the Standards and these Regulations, the purpose of protection of such water uses shall control the meaning. It is the further purpose of this part to preserve and protect the quality of Basin waters in a safe and adequate condition for the uses specified in the Comprehensive Plan.

Article 3-2

Section 3-2.1 Water Quality Criteria. Stream quality objectives as set forth in the Standards shall be the criteria under these Regulations.

(1) *Purpose.* It is the purpose and intent of the stream quality objectives specified in the Comprehensive Plan to apply to artificial (man-made, as opposed to natural) causes of pollution.

(2) *Additional specifications.* The Standards have set limits for most of the significant and commonly-used indicators which are pertinent to water quality management in the Basin. When a need arises, or upon application to the

Commission, additional indicators and limits will be defined.

(3) *Water quality measurements.* Water quality shall be measured outside of mixing areas when such areas are designated by the Commission.

(4) *Tributaries to interstate waters.* Waste discharged into, or permitted to flow into, or be placed in any intrastate tributary of interstate waters shall be treated to such extent as may be necessary (i) to maintain the waters of such intrastate tributary, immediately above its confluence with such interstate waters, in a condition at least equal to the water quality criteria specified for the receiving interstate waters, and (ii) so that the assimilation of such waste by the interstate waters will not result in a violation of such water quality criteria.

Article 3-3

Effluent Quality Requirements

Section 3-3.1 Prohibited Discharges. No person, firm, partnership, corporation, association or other entity, including any of the signatory parties, any political subdivision, agency department or instrumentality of any of them, shall cause or permit any pollution or violate the effluent quality requirements or allocations of stream assimilative capacity imposed by or determined pursuant to this Article.

Section 3-3.2 Biochemical Oxygen Demand. The biochemical oxygen demand (BOD) shall mean the oxygen utilized during the first five days of aerobic decomposition at 20 degrees C consistent with the latest edition of "Standard Methods for the Examination of Water and Wastewater," published jointly the American Public Health Association, the American Water Works Association, and the Water Pollution Control Federation.

Section 3-3.3 Carbonaceous Oxygen Demand. The carbonaceous oxygen demand of wastes forms the basis for allocating the capacity of the receiving waters to assimilate the oxygen demand generated by the waste discharges. The carbonaceous, or first stage, oxygen demand is defined as the oxygen utilized in the carbonaceous reaction, as distinguished from that utilized in the nitrogenous or second stage reaction. The carbonaceous oxygen demand is calculated by projecting the logarithmic rate of carbonaceous oxidation to completion.

Section 3-3.4 Nitrogenous Oxygen Demand. The Commission will consider the nitrogenous demand of wastes, which generates a further gross oxygen demand upon the receiving waters, in establishing treatment requirements where appropriate.

Section 3-3.5 Minimum Treatment. All wastes shall be treated to remove practically all suspended solids and shall receive such additional treatment as determined by the Commission upon consideration of the waste assimilative capacity of the receiving stream and as required to meet the limitations of Article 2-1 of the Standards. Wastes containing biodegradable matter shall receive a minimum of secondary treatment as defined in the Standards. Biodegradable and other waste matter to be treated or reduced shall not include that incorporated in influent waters, unless special circumstances as determined by the Commission require such inclusion.

Section 3-3.6 BOD Reduction. The 85 percent minimum BOD reduction for secondary treatment will be determined by an average of samples taken over each period of thirty consecutive days of the year. It is recognized that optimum efficiency may not be achieved with certain secondary treatment facilities during the colder months. A slight deviation may be permitted by the Commission when it results from reduced plant efficiency caused by temperatures below 59 degrees F (15 degrees C).

Section 3-3.7 Effective Disinfection. Effective disinfection is defined as the destruction of pathogenic organisms. Since isolation of pathogenic organisms in water is not routine, the test for the fecal coliform group of organisms will be used as an indicator.

(1) *Coliform requirement.* Effective disinfection means the treatment of wastes such that the number of organisms of the fecal coliform group remaining after treatment does not exceed 200 per 100 milliliter as a geometric average, nor 1000 per 100 milliliter in more than 10 percent of the samples taken over a period of thirty consecutive days.

(2) *Chlorination.* Chlorination facilities shall be designed to obtain a minimum contact time of 15 minutes at peak hourly flow. After the required contact time, maintenance of a free chlorine residual of 1.0 milligram per liter at all times, as determined by the orthotolidine-arsenite (OTA) test, will be considered satisfactory if the effluent is found to meet the coliform requirements of this section.

(3) *Other methods, other tests.* Other methods of achieving effective disinfection and other tests which satisfactorily demonstrate that effective disinfection has been achieved may be approved by the Commission.

Section 3-3.8 Other Substances in Effluents

(1) *Color.* For municipal or sanitary wastes, the effluent shall not impart objectionable color to the receiving waters, nor exhibit a true color of more than 100 units on the platinum-cobalt scale, or the natural color of the receiving waters, whichever is greater. Requirements for industrial wastes containing color will be determined by the Commission.

(2) *Dissolved substances.* Dissolved and colloidal substances, including nutrients, discharged in waste effluents shall be limited where necessary to prevent deposition of sediments, formation of flocculent materials, or excessive aquatic growths, that impair protected uses, violate water quality criteria, or generate additional oxygen demands upon the receiving waters.

Section 3-3.9 Temperature - Nontidal Areas

(1) *Trout waters.* In waters classified for trout use the discharge of waste effluents shall not increase the natural temperature of the receiving waters by more than 5 degrees F (2.8 degrees C), nor shall such discharge result in stream temperature exceeding 70 degrees F (21.1 degrees C), which temperature shall be measured in the stream outside of mixing areas designated by the Commission.

(2) *Nontrout waters.* In waters other than described in paragraph (1) above, the discharge of waste effluents shall

not increase the natural temperature of the receiving waters by more than 5 degrees F (2.8 degrees C), nor shall such discharge result in stream temperature exceeding 87 degrees F (30.6 degrees C), which temperatures shall be measured in the stream outside of mixing areas as described below.

a. *Heat dissipation areas.* The limitations specified above may be exceeded by special permit in heat dissipation areas designated by the Commission, subject to the following conditions:

(i) *Maximum length.* Heat dissipation areas shall not be longer than 3500 feet, or twenty times the average width of the stream, whichever is less, measured from the point where the waste discharge enters the stream.

(ii) *Maximum width.* Heat dissipation areas shall not exceed a maximum width of one-half the surface width of the stream or the width encompassing one-half of the entire cross-sectional area of the stream, whichever is less. Within any one heat dissipation area, only one shore shall be used in determining the limits of the area.

(iii) *Adjacent heat dissipation areas.* Where waste discharges would result in dissipation areas in such close proximity to each other as to impair protected uses, the Commission may prescribe additional limitations to avoid such impairment.

Section 3-3.10 Temperature – Tidal Areas. The induced temperature increase shall not exceed 5 degrees F (2.8 degrees C) above the average daily temperature gradient displayed during the 1961-1966 period, or a maximum of 86 degrees F (30 degrees C), whichever is less, which temperatures shall be measured outside of mixing areas designated by the Commission.

The average daily temperature gradient displayed during the 1961-1966 period may be interpolated from the following table, which is based on available records:

Date	Zone 2 R.M. 133.4 to 108.4		Zone 3 R.M. 108.4 to 95.0		Zone 4 R.M. 95.0 to 78.8		Zones 5 & 6 R.M. 78.8 to 0.0	
	°F	°C	°F	°C	°F	°C	°F	°C
Jan. 1	37	2.8	41	5.0	42	5.6	39	3.9
Feb. 1	35	1.7	35	1.7	36	2.2	33	0.6
Mar. 1	38	3.3	38	3.3	40	4.4	38	3.3
Apr. 1	46	7.8	46	7.8	47	8.3	46	7.8
May 1	58	14.4	58	14.4	58	14.4	56	13.3
June 1	71	21.7	71	21.7	72	22.2	69	20.6
July 1	79	26.1	79	26.1	80	26.7	78	25.6
Aug. 1	81	27.2	81	27.2	81	27.2	79	26.1
Sept. 1	78	25.6	79	26.1	78	25.6	78	25.6
Sept. 15	76	24.4	77	25.0	76	24.4	76	24.4
Oct. 1	70	21.1	70	21.1	70	21.1	68	20.0
Nov. 1	59	15.0	61	16.1	60	15.6	57	13.9
Dec. 1	46	7.8	50	10.0	50	10.0	48	8.9
Dec. 15	40	4.4	45	7.2	45	7.2	43	6.1

Section 3-3.11 Allocation of Capacity

(1) *Basinwide.* Where necessary to maintain stream quality objectives or protect water uses in a given zone, the waste assimilative capacity of the receiving waters shall be allocated by the Commission among individual dischargers in accordance with the doctrine of equitable apportionment.

a. *Commission procedure.* Whenever the Commission determines that allocations of a stream's waste assimilative capacity are necessary in a zone, the Executive Director shall find and determine an allocation for each waste discharge in that zone. Such determination shall be governed by the Commission Rules of Practice and Procedure relating to review, hearing and decision of objections thereto.

b. *Allocations not a property right.* Allocations are not transferable, except upon consent of the Commission.

c. *Limitations.* No allocation will exceed the residual after treatment as required in accordance with Section 3.5 of this Article. No allocation will exceed the residual after treatment necessary to meet any other requirement.

d. *Reserve.* In each zone, as part of the initial allocation, and each subsequent reallocation, a reserve may be set aside by the Commission.

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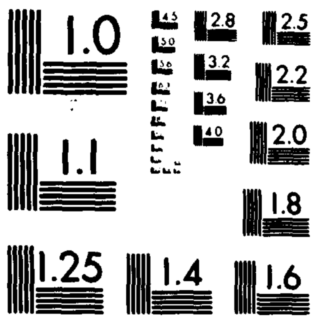

(i) The reserve in each zone shall be utilized to accommodate new discharges or major changes which occur subsequent to the initial allocation, or any reallocation, when appropriate in the judgment of the Commission.

(ii) Individual allocations or portions thereof which are no longer needed because use of the facilities to which they are assigned is discontinued or substantially decreased shall be returned to the reserve.

(iii) Where improved waste management practice results in a reduction of the load discharged to less than the allocation, the unused portion of the allocation shall not revert to the reserve.

e. *Reallocations.*

(i) All allocations shall be subject to review by the Commission and, after such review, the Commission may make such reallocation as it deems necessary.

(ii) If any factors upon which an individual allocation is based change significantly, application shall be made for reallocation.

(iii) Whenever the reserve in a zone approaches depletion, or when the full use of the assimilative capacity is approached, or when, in the judgment of the Commission, *the allocations existing* at that time are no longer equitable, the capacity in the zone, minus a reserve, will be reallocated among the waste dischargers in that zone.

f. *Regionalization.* Whenever two or more waste dischargers with separate allocations formulate a regional plan for water quality control, allocations may be revised by the Commission.

g. *Design streamflow.* For the purpose of determining the waste assimilative capacity of a stream, the following design minimum streamflows will be used:

(i) *Unregulated streams.* Where streams are unregulated, a minimum consecutive 7-day (average) flow with a 10-year recurrence interval shall be the design flow.

(ii) *Regulated streams.* Where the pattern of regulation is such as to result in weekly, daily, or hourly variations in flow significantly different from the natural pattern of variation, the above design flow may reflect the effects of these variations.

(iii) *Lakes and reservoirs.* Wherever waste discharges may affect the protected uses of lakes or reservoirs, the Commission, after consultation with the appropriate States, will determine the characteristics upon which to base effluent quality requirements in relation to the special characteristics of the receiving body of water.

(iv) *Tidal waters.* Wherever waste discharges may affect the protected uses or the water quality criteria of tidal waters, the Commission, after consultation with the appropriate States, will determine the characteristics upon which to base effluent quality requirements in relation to the special characteristics of the receiving body of water.

(2) *Delaware River Estuary*

a. *Carbonaceous oxygen demand.* Pursuant to the provisions of Section 2-1.3(5) of the Standards, the Commission determines that the 1964 carbonaceous oxygen demand of the effluent load to Zones 2, 3, 4, and 5 exceeded the waste assimilative capacity of those zones to meet the stream quality objectives. Accordingly, the total carbonaceous oxygen demand exerted by the sum of all waste discharges to each of these zones shall be reduced to the following:

Zone 2	18,600 lbs. per day
Zone 3	144,800 lbs. per day
Zone 4	91,000 lbs. per day
Zone 5	67,600 lbs. per day

(i) *Reserve.* In Zones 2, 3, 4, and 5, as a part of the initial allocation, and each subsequent reallocation, a reserve of about 10 percent of the total permissible load to the zone may be set aside by the Commission.

(ii) *Allocation to individual dischargers.* Within Zones 2, 3, 4, and 5, the pounds of carbonaceous oxygen demand prescribed above, minus the reserve, will be allocated among individual dischargers. Allocations will be based upon the concept of uniform reduction of raw waste in a zone.

(iii) *Allowable variations.* The number of pounds in the discharge permitted by the allocation will be determined by an average of samples taken over each period of thirty consecutive days of the year. It is recognized that optimum efficiency may not be achieved with certain secondary treatment facilities during the colder months. A discharge exceeding the allocation may be permitted by the Commission when it results from reduced plant efficiency caused by temperatures below 59 degrees F (15 degrees C), provided that the pounds discharged by any individual discharger shall not exceed its allocation by more than an average of two-thirds over any consecutive ten days.

(iv) *Allocations from the reserve.* Allocations from the reserve will be made upon the same principles as provided in paragraph (ii) above, based upon the concept of uniform raw waste reduction in a zone at the time the allocation is made.

(v) *Reallocations.* Reallocations will be made upon the same principles as provided by paragraph (ii) above, provided that where the waste reduction by any discharger results in lower poundage input than it has been allocated such poundage differential will not be returned to the reserve in the absence of conditions requiring a reallocation for the zone.

(vi) *Tidal tributaries.* Wastes discharged to the portions of tributaries of the Delaware River Estuary affected by tidal action are included in the total permissible load in each zone, and poundage allocations will be assigned to these dischargers on the same basis as effluents discharged directly to the estuary. However, additional requirements may be imposed if any one or group of waste dischargers complying with estuary load allocations exceeds the waste assimilative capacity of the tidal tributary.

Section 3-3.12 Intrastate Tributaries. In addition to the requirements of this Article, effluent quality requirements on intrastate tributaries shall include such regulations as the State in which the tributary is located may impose in order to comply with the water quality criteria provided by Section 3-2.1(4).

Section 3-3.13 Tests, Sampling, and Analysis Procedures.

(1) *Records.* Adequate records shall be kept by the

discharger of the operation of each facility which discharges waste effluents to Basin waters, as required by the member state pollution control agencies, or as may be required by the Commission. Such records shall be made available to the Commission upon request of the Executive Director.

(2) *Sampling facilities.* Facilities, subject to Commission approval, shall be provided for each discharge so that representative samples may be readily collected under safe conditions.

(3) *Sampling.* Samples shall be taken by the discharger in such manner and in such number as shall be determined by the Commission upon consideration of the volume, location, and characteristics of the wastes, sufficient to permit the Commission to determine the quality of waste treatment influents and effluents and evaluate in-plant reductions. Samples may be composited, continuously or hourly, in proportion to flow over 24 hours, or over a working cycle, as appropriate.

(4) *Bioassays.* The Commission may require bioassays to demonstrate that waste discharges are neither toxic nor harmful and will not taint fish or shellfish flesh beyond the mixing zone.

(5) *Analysis procedures.* Samples shall be analyzed and bioassays performed in accordance with the procedures in the latest edition of "Standard Methods for the Examination of Water and Wastewater," or as prescribed by the Commission.

(6) *Access.* The Commission, its officers, agents, and employees shall have access to observe and inspect waste treatment and in-plant control facilities and to collect samples for analyses.

Section 3-3.14 Operations. Waste treatment operations shall not be curtailed at any time of the year. Operations shall be under the supervision of an operator qualified in training and experience.

Article 3-4

Enforcement Procedures

Section 3-4.1 Scope. The Standards will be enforced with respect to effluent quality requirements in accordance with a schedule to be adopted by the Commission. It is intended that such enforcement procedures will be administered with due recognition and with the utilization to the maximum practical extent of the functions, powers, and duties of water pollution control agencies of the signatory parties and in accordance with administrative agreements which may be entered into by and between the Commission and such agencies.

Section 3-4.2 Abatement Schedules

(1) *Schedule.* Each discharger, within 90 days after receiving a notice of allocation or an abatement order under these Regulations, shall submit to the Commission through the appropriate state water pollution control agency a proposed abatement schedule. The schedule shall establish the time within which the discharger proposes to comply with the requirements of these Regulations. The schedule, without limitation thereto, shall include the following stages:

(i) Submission of engineer's report;
(ii) Submission of contruction plans;
(iii) Start of construction;
(iv) Completion of construction;
(v) Start of operation.

a. *Form.* The abatement schedule shall be filed in such form and contain such additional information as shall be prescribed by the state agency. A copy thereof shall be filed simultaneously with the Commission.

b. *State procedure.* Such agency, in accordance with its established procedures, rules and regulations, may review a proposed abatement schedule and file its findings and recommendations with the Commission.

(2) *Commission action.* The Commission, in accordance with its Rules of Practice and Procedure, will consider the findings and recommendations of the state agency, provide for such review and hearing as may be required, and determine and approve an abatement schedule. The Commission will approve a proposed abatement schedule as submitted or will modify and approve such schedule as modified, whenever it finds that the schedule will: (i) provide for an efficient use of the economic resources of the Basin, both public and private; (ii) give due priority to the relative significance and urgency of reducing the pollution load of the various waste discharges into waters of the Basin; and (iii) accord due weight to such other considerations as may be required by Article 5 of the Compact for a reasonable application of the Standards and these Regulations.

(3) *Progress reports.* Each discharger shall submit progress reports to the Commission, in such form and at such times as shall be directed by the Executive Director, with respect to the action upon its abatement schedule.

Section 3-4.3 Alternate Procedure; Notice and Hearing. Whenever the Executive Director deems appropriate, a hearing on a proposed abatement schedule may be held, upon notice to the discharger, by a hearing officer to be designated by the Commission. Such hearing shall be conducted in accordance with the Rules of Practice and Procedure. The hearing officer shall recommend and submit to the Executive Director a proposed abatement schedule. He shall also transmit a copy thereof to the appropriate State agency with a request to forward comments within 20 days. Upon approval of the schedule by the Executive Director, he shall cause a copy thereof to be served upon the applicant, including notice to the applicant of its right of review before the Commission. The abatement schedule shall become final if the applicant shall fail to file with the Commission within 10 days from the date of service a demand for such review by the Commission.

Section 3-4.4 Inspection and Surveillance. The Commission, its officers, agents, and employees may inspect the operations of waste treatment and in-plant control facilities of any waste discharger and may install, operate, and maintain facilities for monitoring and surveillance of effluents as well as water quality objectives. Provision for such monitoring and surveillance shall be deemed to be part of every order, determination, or permit of the Commission approving an allocation or an abatement schedule for any waste discharger.

Section 3-4.5 Noncompliance; Notice. Whenever the Executive Director determines that there is cause to conclude that a waste discharger may be in violation of these Regulations, the Director shall serve upon the waste discharger a notice of hearing, requiring the waste discharger to show cause within 20 days thereafter, at a hearing to be conducted by a hearing officer designated by the Director, why a citation for noncompliance should not be issued. Following the hearing, the officer shall determine whether the waste discharger is in fact in violation of these Regulations and upon such finding shall recommend to the Executive Director an appropriate determination. If the Executive Director determines that the waste discharger is in violation, he shall cause to be issued and served upon the waste discharger a citation for noncompliance. A copy of the citation shall also be served and filed with the water pollution control agency of the signatory State in which the violation occurs.

Section 3-4.6 Order of Abatement; Sanctions.

(1) *Order.* An order of abatement shall be issued by the Executive Director, following a citation for noncompliance, whenever:

(i) The state pollution control agency has not taken appropriate and timely action to obtain compliance, or

(ii) There is a disagreement between two or more States regarding satisfactory compliance by a waste discharge, or

(iii) A waste discharge involves a federally-owned or operated facility, or

(iv) There is doubt or conflict of jurisdiction among the States.

(2) *Sanctions.* The Commission may invoke the sanctions of the Compact for violation of these Regulations following the issuance of an order of abatement by the Executive Director.

Section 3-4.7 Effective Date. These Regulations shall take effect 30 days after adoption by the Commission.

Article 4

Regional Requirements

It shall be the policy of the Commission to promote and encourage planning for regional solutions to water pollution problems. The use of regional water pollution control facilities providing optimum combinations of efficiency, reliability and service area will be required throughout the Delaware River Basin to the maximum extent feasible. The Commission will cooperate with industries and state, county and municipal agencies seeking a regional solution to water pollution problems. The Commission may provide planning, and, when necessary, constructing, financing and operating services required for regional solutions to water pollution problems where other appropriate agencies do not provide such services.